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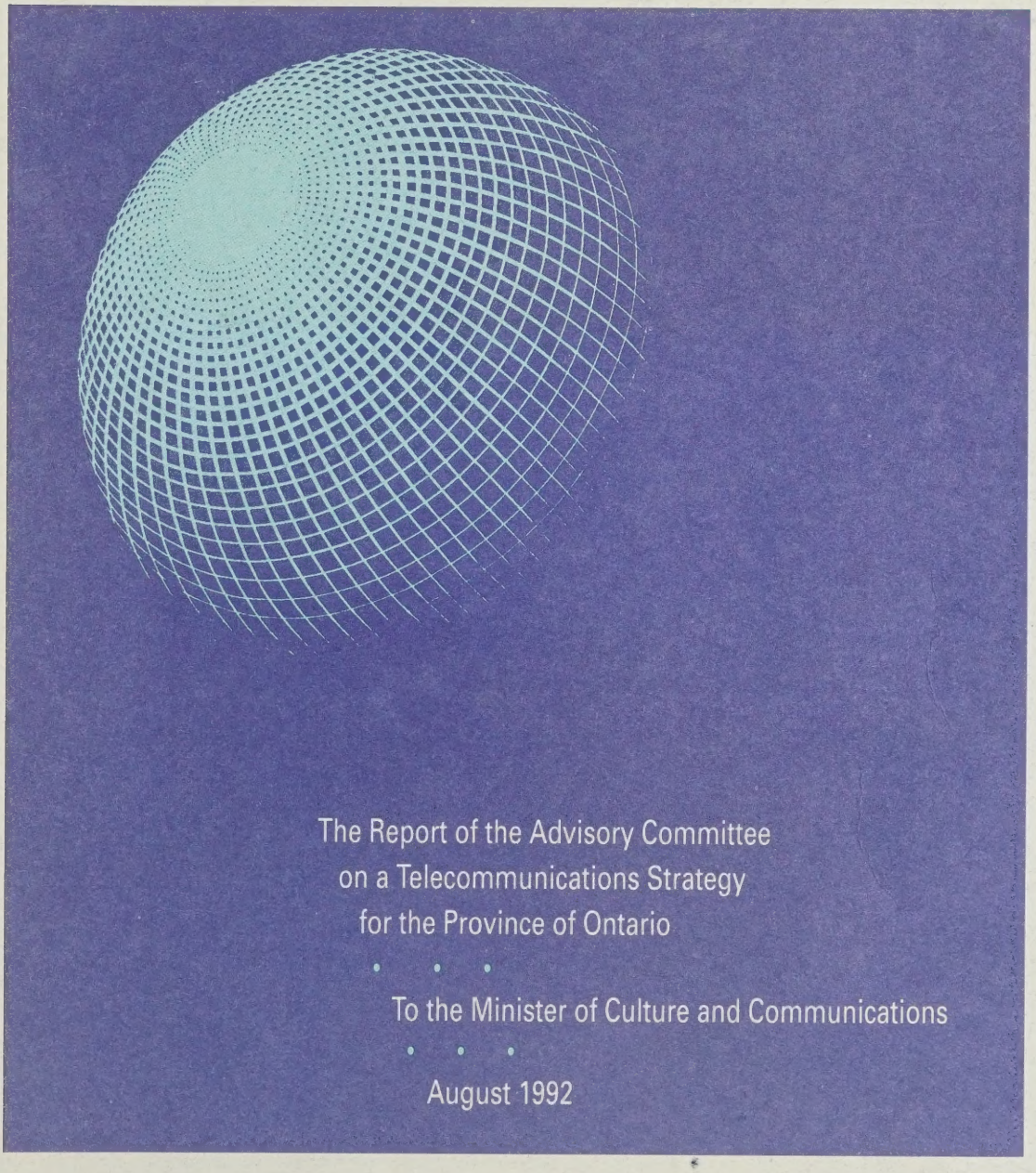

The Report of the Advisory Committee
on a Telecommunications Strategy
for the Province of Ontario

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To the Minister of Culture and Communications

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August 1992

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Published by the Ministry of Culture and Communications
for the Advisory Committee on a Telecommunications Strategy
for the Province of Ontario
Printed by the Queen's Printer for Ontario
Province of Ontario, Toronto, Canada

© 1992, Queen's Printer for Ontario

ISBN 0-7778-0186-8
D2664 8/92 3M

Version française disponible

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Introductory Remarks by the Chair

This report is about burning issues facing business, government, labour, communities, and above all, the people of Ontario. These issues are economic renewal, wealth creation and jobs; social development and sustained quality of life; and the reshaping of government for efficiency, deficit reduction, customer service and the effective delivery of government programs.

Technology enables new possibilities. It is the foundation of the information society and the new economy. It is a driver for transformation.

The basic tenet of this report is that we in Ontario, and Canada, are at a turning point in our journey to the new information society. We have a choice. We can continue, business as usual, and in doing so fall behind. Or we can, in partnership, set out on a new course. Such a course involves a change in thinking and the courage to act — to seize the moment. The stakes in doing so are huge.

This report documents the conclusions of the Advisory Committee on a Telecommunications Strategy for Ontario. The Advisory Committee has developed a vision for the future — that enabled by telecommunications, Ontario, and in turn Canada, will be the best place in the world to live, work, learn and do business. The report outlines a framework for decision-making, a number of strategic thrusts, and an integrated set of proposed actions which should be taken, in partnership by key stakeholders, to move Ontario forward in achieving the vision.

Within the first half hour of its first meeting the committee had to grapple with the convergence of computing and telecommunications. The boundaries between the two technologies and their corresponding industries, marketplace, opportunities and issues have blurred to the point where it is counter-productive to attempt a rigid separation. The combination of computing and telecommunications is commonly referred to as information technology. Moreover, there is a convergence occurring between information technology and the industries which provide information — broadcasting, electronic publishing, libraries, even the entertainment industry. It may not be long, for example, before the telephone, television set, and home computer have similar capabilities.

As a result, the Advisory Committee has taken a broad view of the term telecommunications, discussing opportunities, barriers and directions for telecommunications as part of information technology.

Further, this is not simply a sectoral strategy — dealing strictly with the issues of building a vibrant and healthy industry of telecommunications manufacturers, carriers, software companies, and service providers —but instead, a broadly based strategy dealing also with the enabling effects of telecommunications. Telecommunications, and more broadly information technology, do constitute an economic sector — in the United States approaching 10 percent of the gross domestic product. However, these technologies are also beginning to provide the infrastructure of the new economy and society as a whole. For example, banks use networks to deliver technology-based services to customers. Manufacturing in the province will lag without electronic data interchange with suppliers, networks to enable just-in-time inventory control and electronic communications with customers. There are new opportunities to build telecommunications-based consortia in the forest products and housing industries to compete more effectively in international markets. The new open, volatile geo-political environment and the open, competitive business world are creating a demand pull as Canadian businesses and governments embrace information technology to become more productive and effective. This is leading to a retooling of the technology infrastructure in our organizations and our country.

Canada is not just in recession. It is undergoing a restructuring. Terms like "service economy" may be misleading: industrial production and agriculture will continue to be important as long as humans have needs to eat, be housed, be clothed and move around. However, just as agriculture was transformed by the industrial revolution, so both agriculture and industry are being transformed by the information age. And just as the highway system was the infrastructure for the industrial economy, so our telecommunications networks will be the highways for the new economy. Without a state-of-the-art, electronic infrastructure, our businesses, organizations and society cannot succeed. The new environment demands change.

Simultaneously, the technology itself is creating a technology push for change, given the enormous new technological capabilities which are unfolding. Telecommunications is a driver for economic and social transformation. There are new, far reaching opportunities to build high performance businesses; to improve the quality of health care while lowering costs; to cut use of automobiles and deadly emissions from the internal combustion engine; to reach out to Northern communities; to improve participatory democracy and to build a new, open networked Canada which, for example, empowers people, regions and communities. Further, the plummeting costs of information technology in many areas are pushing organizations to consider a vast array of new application types, and to demand that prices drop in areas such as long distance telephone services.

We are being pushed and pulled into far-reaching change.

The Challenge of Codetermination

Given the need for clear direction, the Ontario Government decided that a strategy should be codetermined by a representative group of stakeholders, rather than by government officials. The notion of codetermination is that through effective collaboration among stakeholders the ensuing strategy will be better, jointly held, and more likely to be implemented.

On behalf of the Advisory Committee, I can report that, so far, this approach is sound. The telecommunications strategy process involved over 100 leaders from business (both users and suppliers), government, labour, academia, community interests, and other stakeholders working together over a four month period. The Advisory Committee and four different sub-committees held dozens of meetings, workshops, round tables and consultations. By the most conservative measures of evaluating executive time, this was a multi-million dollar voluntary effort contributed by those involved.

As the chair of this process, I can also report that codetermination is an unwieldy business. Among those involved in the process were representatives of every shade on the political spectrum, organization size, interest group, and perspective on the issues.

Despite a wide divergence of views, the process worked. We achieved, as one participant described it, "raging agreement" on a wide range of issues.

A number of factors contributed to what has been effective codetermination.

A first factor is that the participants in the process took it seriously. Attendance at meetings was excellent, and members of all committees worked hard. They came to meetings prepared and were vocal, thoughtful and active throughout. Committee members expressed a resolve that this be a productive process, reflecting the quality of the team and the size of the stakes.

While there were sometimes intense debates, there was a good understanding from the outset that we did not need a process like this to simply exchange historical positions on issues. There was a strong sense that we needed to rise above old differences, find areas of common interest and forge new agreements. In part, this was due to the contextual shift a process like this creates. We were no longer meeting simply as competitors in the marketplace or combatants across the negotiating table, but as co-owners of a new opportunity to bring about change that is in our mutual interest.

Second, while some were initially sceptical, Advisory Committee members came to believe that the Ontario Government is serious about telecommunications, the need for a strategy, the codetermination process and about taking action based on the conclusions outlined herein. This belief was a precondition for the effort to be taken seriously. The proof of the pudding will, of course, be in the eating.

Another factor is that the process was, to a large extent "user driven." Historically, discussions regarding telecommunications in Canada have primarily focused on the supplier side — the characteristics of the network, rate of return for suppliers, structure of the industry, regulatory matters, and the like. There was strong agreement that telecommunications is critical to Ontario's future, both as a sector and an enabling infrastructure. Ontario is strong in both these areas but there are signs of problems — our positive balance of trade in telecommunications equipment is slipping, and the diffusion of new telecommunications applications is slow. Industry structure and other concerns were identified and discussed as potentially contributing factors. However, the Committee generally focussed its attention on the needs of the broad spectrum of end-users.

For example, there was agreement that our vision of Ontario in the next decade included a wide range of multi-media services to every office, factory, home, school and laboratory —

requiring high capacity networks which don't currently exist. However, it is impossible to determine which, or which combination of, transmission media will deliver such services. Networking from the curb to the home, for example, may be achieved through fibre, co-axial cable, or radio transmission on neighbourhood poles — to mention a few technologies. In the absence of a clear understanding of the types of applications to be delivered, it is impossible and undesirable to attempt to pick a winning technology. Rather, it makes sense to have a user focus — to adopt policies and take steps which will encourage the development and use of innovative applications and the growth of user demand, awareness, and application knowledge. In this context, the marketplace will determine which technology approach is best.

The People

In addition to the impressive list and significant effort of committee members, another factor in the success of this process was the excellent support given by the staff of the Ministry of Culture and Communications. Under the day-to-day leadership of Joan McCalla and Phil Baker, a Ministry team of 10 people ensured that the process was relatively smooth and painless. The Staff Secretariat provided logistics support, specialized knowledge, sound advice on a wide range of issues and also tracked and synthesized the results of the process. After one particularly long and arduous meeting the staff actually received a spontaneous applause from the members of the Advisory Committee for their background support in pulling together the issues. Special thanks go to Lisa De Oliveira for her excellent administrative coordination throughout the process, and her long hours in preparing the final report. Additional thanks go to Tom Grandy at NGL Consulting Ltd. for his work in preparing the report, and to Jonathan Forbes and his colleagues in the Minister's office for leadership in conceiving and assisting the process.

On behalf of all Advisory Committee members, sincere thanks to Minister Karen Haslam for her vision in undertaking the effort. Thanks also to Culture and Communications Deputy Minister Elaine Todres who acted as committee secretary. Her sense of urgency and numerous insights on the issues raised were critical to the effort.

I am particularly indebted to and impressed with the chairs of our four sub-committees, who dedicated several months of their time in the interest of the future of the province and country:

- Lis Angus — a widely respected authority and consultant on telecommunications — chaired the sub-committee dealing with the telecommunications infrastructure for economic renewal in the province.
- Alex Curran — one of the leading executives from the telecommunications industry — chaired the sub-committee dealing with the telecommunications sector.
- Richard Long — who leads the 20,000 members of the Ontario division of the Communications and Electrical Workers of Canada — chaired the sub-committee dealing with issues of improving quality of life through telecommunications.
- Elaine Todres — who as Deputy Minister of Culture and Communications also chaired the sub-committee on the strategic application of telecommunications in government.

Each of these committees had its own unique personality and dynamics. Each was led differently by their chairs. Each was an extremely productive effort which produced innovative and worthwhile results.

My thanks are also extended to these four people for their participation on a coordinating committee which assisted me in steering the project and served as the editorial committee for the report.

Finally, Ontario owes a debt of thanks to the one hundred plus members of the various committees and round tables. Personally, I am honoured to have worked with them.

The Report and Conclusions

The report outlines a framework for Ontario to move forward. As you will read, there are many steps which we in Ontario can take. However, no province is an island. Canada as a whole must break through to the new economy for Ontario to succeed. As a result, we have avoided recommendations that would pit Ontario against other jurisdictions. For example, we have rejected government procurement strategies to "buy Ontario" in favour of those which will develop the sector and infrastructure for Canada. There are also actions which will require the participation of the Federal Government, other provinces and businesses outside Ontario. It is our hope that Ontario, by providing leadership on telecommunications, will help Canada as a whole make the turn. For example, Ontario leadership in implementing a world class research and education network for the province will complement and accelerate such activity in other provinces and at the national level.

Notwithstanding the fact that this is an Advisory Committee to government, the recommendations made herein are directed not only at government but to a wider audience. We believe that government alone cannot take the kind of action required to achieve the vision. Rather, this can only be done through partnerships and individual actions of all stakeholders.

While the report sets out a clear direction, the focus of the effort was not on the document but on the process of identifying common interests and forging new directions. We wanted this to be an action-oriented process, which prior to publication of its report would generate new relationships, new thinking and new initiatives.

For example, the process was an effort in team learning. As the President of a large company said to me, "One of the main benefits for me is that I learned a lot. I feel much better equipped to succeed in this market as a result of having participated." In another example, a partnership between an important telecommunications user, a carrier and other companies was initiated through one of the discussions. In another, at least two major purchasers of information technology equipment and services have already begun to change their procurement practices to help strengthen small Canadian suppliers. In yet another, stalled initiatives in a number of areas have been given a boost. To the surprise of many of us, this process has become a prototype for codetermination, team learning and the breaking of log jams.

The Advisory Committee is determined that the report will not become shelfware. The strategy requires ongoing work to keep it alive — to do detailed planning of initiatives,

implement new policies, build new partnerships. The test of this process will not be how highly readers think of the document, but rather the actions which are taken to achieve the vision. Although the Advisory Committee has completed its work, there are many processes which have already been initiated and new processes to launch. This has not been a one-shot effort. The process has just begun. Given the stakes for Ontario and Canada we cannot afford to drift.

Please read on and take action, so that Ontario and Canada may succeed.

Don Tapscott
Chair,
Advisory Committee on a Telecommunications Strategy for Ontario

Executive Summary

> The mid 1980s and 1990s will not only be remembered as painful and turbulent times. They will also be identified as the years when Ontario ceased to be primarily an industrial society and began to be an information society. The transition is fundamentally reshaping both the nature and substance of economic and social activity in the province. It is changing how people live their lives, both personally and publicly through their dealings with government, with employers and co-workers and with retailers and others supplying goods and services in society. It is also changing how institutions such as corporations and governments conduct and define themselves. (From a presentation by Heather Menzies.)

The Advisory Committee on a Telecommunications Strategy for the Province of Ontario was constituted by the Minister of Culture and Communications on March 17, 1992. In addition to the 22-member Committee, over 80 other individuals contributed considerable time and knowledge through four subcommittees, three round tables and additional written submissions, to develop a strategic direction and action plan for the province. On a broader basis, a number of interested individuals and organizations submitted proposals and comments which were very helpful.

All of these individuals gave freely of their time because they believe strongly that the issues under discussion are critical. All believe that the stakes are high for themselves as individuals, for their organizations, communities, the province and the country.

The Advisory Committee hopes that these efforts will not be wasted. Effective action must result from the conclusions of this process in that implementing the main recommendations will produce measurable, long-lasting benefits for Ontario and for Canada.

The Vision

The Advisory Committee holds that through the enabling effect of telecommunications, Ontario, and in turn Canada, will be the best place in the world to live, work, learn and do business.[1]

[1] Telecommunications is defined as the input, processing, storage, transmission and output technologies — and associated software and services — that enable electromagnetic communication of information. This broad definition reflects the growing convergence of traditional telecommunications with computing on the one hand and the industries which provide information on the other.

We can only achieve this vision of economic renewal and sustained social development by exploiting the capabilities of the new information technologies to reshape what we do and how we do it. In the new knowledge-based economy, individuals will create wealth by applying information, human intelligence, effort, and technology to manufacturing, agriculture and services. This new economy will be part of the larger information society — the social and economic organization of the information age. In the information society, the purpose of wealth creation will not simply be profit for a few, but a more equitable and more prosperous society for all.

The Goals

To achieve the vision we have adopted four goals for the province. They provide a framework for learning, action and leadership.

Goal 1. A telecommunications infrastructure which will enable Ontario — and in turn Canada — to enjoy economic growth, competitiveness and sustained employment in high paying, high value jobs.

This new infrastructure is analogous in many ways to existing transportation systems, gas and electrical utilities, and other public services. Often referred to as the "highway of the future", it is a vital part of the knowledge-based economy. A leading-edge, national information infrastructure — including associated applications, products, services and software, could provide a critical competitive edge for all industrial sectors.

Cost effective, state-of-the-art, high quality, interoperable networks are an absolute necessity for the telecommunications infrastructure, and Ontario must act to ensure that they are ubiquitous in the province. We are already well positioned in this regard. Ontario's telecommunications carriers have extensive networks in place, most employing digital switching and transmission. Cable television networks provide a broadband capability to a high percentage of homes. Fibre optics is extensively and increasingly used, and satellite networks both compete with and complement terrestrial networks in serving business and government. Several radio-based mobile services, such as cellular networks, are available. Others, including personal "cordless" systems, are right around the corner. While the new marketplace will stimulate network growth and activity, achieving interoperability of these networks remains a challenge.

Networks alone are not enough. Users also need innovative affordable business services which support economic growth and enable productivity and competitiveness. Just about everyone we met raised concerns about this issue. The absence of competition in the provision of many services, and a regulatory approach that kept long distance prices artificially high, has — in the view of many users and providers — limited the variety of services available, the speed of their introduction, and their affordability. During the course of the Committee's work the Canadian Radio-television and Telecommunications Commission announced its historic decision favouring the competitive supply of public switched long-distance telephone service. Not everyone involved in the process favoured this decision. However, there was widespread agreement among both users and providers that an open, competitive marketplace for telecommunications and information technology products and services is critical to our future.

A third element in developing an advanced infrastructure is the presence of active and informed users. Users must be able to effectively exploit technology and demand innovative products and services from suppliers. While Ontario has many relatively sophisticated users, bridging the gap between current levels of awareness and future opportunities represents a huge challenge. This is a task for users and suppliers alike.

Goal 2. A dynamic, growing telecommunications sector, including manufacturing, software, services, the information provision industry and research and development.

The sector itself is a central component of the new economy, and needs positive conditions to flourish. Ontario is already a strong player in the international market, but we must act to protect our manufacturing base and enhance the pace of growth in shipments of telecommunications equipment. Canada has not succeeded in the computer hardware industry. Free trade, while improving access to U.S. markets, has weakened the case for keeping some manufacturing operations in Ontario and Canada. Ontario wage rates are higher than those in many other regions — certainly compared to countries such as Mexico. Notwithstanding these factors, along with the growing opportunities to focus on software and services, the Advisory Committee believes that Ontario can remain a home for telecommunications manufacturing.

We believe that Ontario can, and will, succeed in manufacturing. The Advisory Committee supports a strategy which focuses on manufacturing competitiveness through a value-added labour strategy. In the first place, a low wage strategy is inappropriate for Ontario manufacturers. Moreover, manufacturing wages now represent only a small percentage of overall production costs. Much advanced equipment manufacturing now requires knowledge workers; in at least one Northern Telecom plant the average worker has the equivalent of a community college degree. Furthermore, the tendency to locate research and development with or near manufacturing creates new opportunities to develop a high value labour force.

To achieve our goal of a strong telecommunications supply sector, there are other points we must address. The industry voiced concerns about such issues as constitutional uncertainty, personal and corporate taxation levels, higher Canadian interest rates, the high Canadian dollar, poor access to venture capital, and missed opportunities to use the purchasing power of major buyers such as Bell Canada or the Ontario Government to strengthen Canadian suppliers.

The value-added services and software industries, the fastest growing segment of the information economy, represent a huge opportunity. Before the end of the decade, software and services will surpass hardware as a proportion of information technology revenues. Already over 150,000 Canadians are employed in software development. In the future, the value-added services industry will deliver a wide range of increasingly sophisticated services via telecommunications. Banking, security, and interactive entertainment services are already available, but the market is still in its infancy. In North America alone, the information provision industry, even excluding the huge entertainment and broadcasting industries, is a multi-billion dollar business. Significant opportunities exist for the creation, distribution and export of Canadian content and services. There is also a massive marketplace opening up for value-added network providers.

However, there are obstacles. It seemed that at every meeting of every committee, the issue of education arose. The software development industry, for example, is facing a human resource crisis because there are not enough programmers and software engineers skilled in the new approaches. In addition, the potential for the emergence of telecommunications and competing technologies to contribute to the development of new information and cultural products and services is not well understood or fully appreciated. This point was discussed extensively at one of our round table sessions.

Action is also required to ensure that we have internationally competitive carriers. Representatives from these companies expressed determination that Canada catch up to and surpass the variety of services and pricing structures offered by U.S. carriers.

We must also act to strengthen research and development and innovative applications. While Canadian research and development spending efforts do not match those of our competitors, telecommunications research and development is an area of strength. It provides a solid base for expansion. Again, a key concern relates to human resources — a shortage of talented researchers and engineers with the appropriate skills.

Goal 3. To ensure that telecommunications enhances the quality of life of all Ontarians.

Change should not only serve corporate interests for competitiveness. For while the marketplace is a positive force for growth, it is not a given that all in society will automatically benefit. The new technologies have potential benefits which extend far beyond economic development. They have the potential to affect dramatically the life of every resident of the province in a positive way. At the same time, we must be vigilant against other potential dangers of this transformational technology.

To ensure that the benefits of information technology are widely distributed, it is imperative that all Ontarians enjoy equitable access to a growing menu of telecommunications services. Some critics have raised the spectre of technological exclusion, claiming technology will only serve to increase the gaps between have and have-not and between know and know-not. Others fear that women, native peoples, the disabled, and other less powerful groups will be denied full access to the fruits of technological change.

Access alone is not enough. Making advanced services available does not mean that people are prepared to or will necessarily gain from them. Consequently, we must ensure that institutions, structures and processes are in place which allow individuals to benefit from the new telecommunications technologies. In this regard, one major issue is the impact of information technology on employment. People used to fear that technology would eliminate jobs. There is now widespread acceptance of the notion that without a transition to a new technology-based economy, there will be no stable employment base. However, serious disruptions could occur if those displaced by technology do not have the skills to adapt to the new economy. Additionally, the introduction of these new technologies needs to be sensitive to the impact on personal privacy and provide opportunities to improve quality of worklife.

New technologies offer tools to help us do mundane tasks more efficiently than in the past. But they can be much more. We must encourage creative applications of technology and services to ensure that the potential of telecommunications is fully explored and

exploited for the advantage of the people of Ontario. This includes, for example, efforts to develop radically new ways of delivering educational services to isolated communities, using technology in health care, and giving people with disabilities access to greater employment opportunities.

Goal 4. The strategic application of telecommunications by the Ontario Government.

The new technology provides an opportunity for the renewal of government operations and, in some ways, the re-invention of government. Moreover, as government uses technology to reach out to the public, there are new opportunities to achieve a fuller, more open, democracy.

The Government of Ontario has an important role to play both as an example to others in its use of technology, and as a demanding consumer for the private sector to satisfy. As such, the Government as partner and model user can support the overall provincial telecommunications strategy outlined in this document. Through its own use and purchasing power, government can stimulate infrastructure development, help the sector grow, and significantly impact quality of life in the province.

The irresistible force of requirements for cutbacks in public sector spending has met the immovable object of public expectations regarding the services which government should deliver. Tinkering will not fix this problem. The re-invention of government, enabled by technology, can. This needs to be done in a way which is sensitive to the impact on the workforce and the need for retraining of workers.

There are startling new opportunities to improve customer service and program delivery by delivering government services electronically. The Government of Ontario must act to ensure that telecommunications is used to its fullest advantage in the delivery of and access to Government programs and services. Already in Ontario, initiatives are under way in health care, education, transportation and tourism among others.

There are also significant opportunities for government to sell information to more-than-willing purchasers for significant revenue. Insurers, for example, will happily pay for road safety information. The Ontario Government's Teranet land registry project has already shown the way.

Finally, information technology can enable the reshaping of government for more efficient and effective operations. It permits new ways of organization, of structuring government, and of designing work systems. Technologies such as electronic data interchange (EDI) can reduce costs and dramatically accelerate the interaction between government and its clients. Corporate electronic mail standards and systems have proved to be effective in other governments. A consolidated information picture of government operations could transform the management of the Ontario Government. Workgroup computing could build team, as opposed to hierarchical, multi-level, bureaucratic, structures.

However, like many other organizations, the Government of Ontario is locked into the technology and approaches of the past. The Government's computer and telecommunications systems are isolated, un-integrated, expensive to maintain and hard to change. The awareness and know-how regarding the opportunities to reshape government for high performance are limited. To change this situation will require significant action.

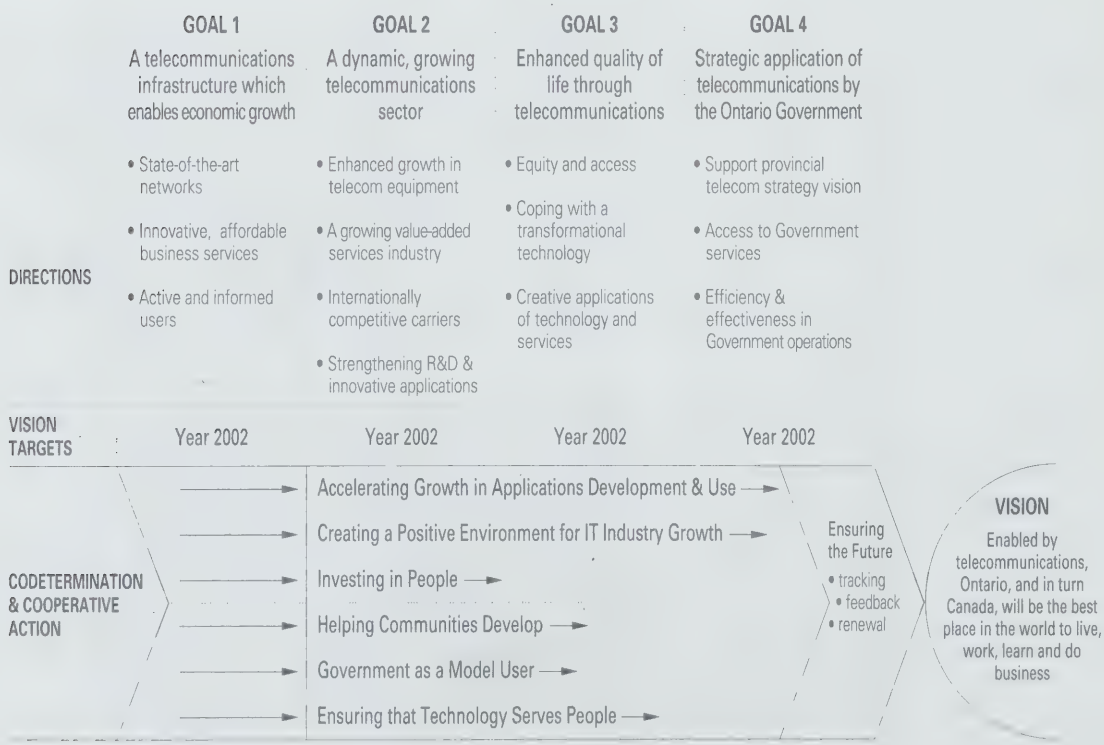
The Strategy of Codetermination and Cooperative Action

Realizing these goals requires the transformation of most institutions in our society. It also requires a fundamental change in the relationships between institutions. Individual actions will not sum up to success.

An historic impediment to achieving our overall vision is that Ontario lacks the kinds of cooperative relationships necessary for success. In Quebec, government programs encourage companies to cooperate to build provincial and national "grapes" or clusters . In Ontario, there are also opportunities to develop these business partnerships which virtually every recent study of Canadian competitiveness has noted are lacking.

For this telecommunications strategy to succeed, Ontario needs new clusters in the telecommunications and information technology industries. Some of these will involve partnerships between competitors. The collaboration between Stentor and Unitel to participate in the development of new national initiatives to stimulate the development and use of future networking technologies is an encouraging start.

A Telecommunications Strategy for Ontario
Campaign for an Ontario Information Infrastructure: Strategic Thrusts



We also need partnerships which extend beyond telecom into other sectors. Every sector, from forest products to automotive manufacturing to hospitality services, can pursue new opportunities for telecom-enabled clusters.

We also need new partnerships which extend beyond the private sector. There are opportunities for cooperative action to build new networks to serve northern communities; to improve links between university researchers and the private sector; or to integrate libraries more fully with communities, schools and businesses.

Every institution of our society will have to change. We must, to quote John Lennon, "imagine." Imagine a future where businesses seek to compete effectively by cooperating; where unions have moved beyond the old adversarial bargaining role to become full partners in wealth creation and social transformation; where business views the labour movement as an asset, rather than an enemy and includes labour in decision-making; where government leads by example in reinventing the enterprise for high performance and customer service; and where schools, colleges and universities work together with the private sector to create an educated workforce.

The Advisory Committee's strategy requires a wide ranging and continuous process of stakeholders codetermining how to make Ontario the best place to live, work, learn and do business. Individuals and organizations must learn together and act cooperatively to ensure that the vision of the future we want becomes the reality we achieve. In many ways the Advisory Committee process has been a prototype of the broader and more intensive effort still required.

The Campaign for an Ontario Information Infrastructure: Six Strategic Thrusts

The Advisory Committee report describes a vision of Ontario in 2002, formulating "vision targets" in the four goal areas cited above. However, to draw the fine line between vision and hallucination requires a realistic action plan. The Committee has adopted six strategic thrusts which cut across the four goal areas listed above. The recommendations contained in these six thrusts constitute an action plan to achieve our vision. The plan will evolve and change. It is not cast in concrete. The key elements are illustrated in the following chart.

The recommendations all centre around the theme that Ontario needs to make a turn — to go on a campaign footing to achieve the vision and goals. All of us — government, business, labour, community interests, educational institutions and other stakeholders — need to focus on transforming ourselves, our organizations and our society. All of us need to marshall our forces and be willing to implement the campaign.

The Ontario Information Infrastructure is the means to achieve our vision for Ontario. The Infrastructure will be a vast array of services and information in multiple media — data, text, voice, image and video —delivered through high capacity, interoperable networks to every home, office, school, factory, and laboratory in the province to Ontarians who know how to obtain and utilize information to meet their needs.

The campaign is a comprehensive program to instill the necessary awareness, to encourage partnering and to initiate the actions required to achieve the Ontario Information Infrastructure. It is designed to have Ontario catch up with, and surpass, other jurisdictions in the United States, Europe and Asia. In some ways the Advisory Committee was the first phase in this campaign.

As we envisage it, the campaign should be overseen by a campaign team called the Council for an Ontario Information Infrastructure. As with the Advisory Committee, the Ontario Government should initiate the team and also provide staff support to make the campaign work. A key function of the campaign team would be to review progress in implementing the Advisory Committee's recommendations. An additional responsibility would be to recommend further actions to ensure the success of the campaign.

Thrust 1. Accelerating Growth in Applications Development and Use

The Committee proposes an integrated set of initiatives designed to position Ontario as a world leader in the development and use of telecommunications applications and to ensure that the province is the first to experience the full benefit of the applications. Actions are required to stimulate awareness and use of applications growth, and the growth of networks to provide access to a wide range of data, voice, image and video services.

Focusing on the applications potential of information technology offers us a rich opportunity to re-examine what we do and the way we do it. Ideally, new and emerging applications will help make our personal lives more fulfilling and our work lives more productive. The creation of new Canadian information products and services will help strengthen our culture. Working at the leading edge of the convergence of computers and telecommunications will test our creativity.

To promote a challenging environment for applications development and stimulate the growth of the information highways required for a knowledge-based society, the Committee proposes accelerating the development in Ontario of specialized information networks, including a research and education network for Ontario. It proposes these be knit into a "network of networks" based on interoperability and wide-spread access. The Committee also urges the Government of Ontario to join with the carriers, including cable, to investigate interoperability and interworking applications.

To support creation of the new business enterprises, in all sectors of our economy, based on full utilization of information technology and encourage innovation in business services development, the Committee recommends establishing a Centre for the Reengineering of Work Through Information Technology.

To create active and informed users, the Committee urges development of a broad public awareness and education campaign on information technologies based on learning by doing.

Thrust 2. Creating the Environment for Growth in the Information Technology Industry

Telecommunications is not only a foundation for wealth creation in all sectors, it is a sector itself. To catch up with other countries, Ontario and Canada need the information technology industry to grow — both absolutely and as a proportion of the economy. From the hundreds of ideas debated, the Committee has put together a package of recommendations which can move us forward. These suggestions address both the demand and the supply sides of the information technology market. A few are illustrated below.

To protect our high technology supply capability, the Committee recommends that the Government continuously monitor the climate for manufacturing and for performing research and development. Ontario must be competitive with other jurisdictions.

To strengthen our telecommunications research base, the Committee recommends action-oriented studies on a software repository in Ontario to place our research community and firms at the forefront of object-oriented software development and on ways to increase private funding for new high-technology ventures.

High levels of research and development are essential in the telecommunications sector. To make it easier to perform research and development, the Committee recommends the development of a provincial high-speed research network. As an aid to bringing research and development to market, the Committee suggests new mechanisms to stimulate technology transfer and programs to encourage collaboration between research and development performers and end-users.

To grow the market, the Committee recommends that the Government of Ontario become a model user and the most demanding customer for Canadian information technology goods and services. The Committee also recommends that the Government develop new approaches to procurement and supplier development. The Committee supports a growing, open, competitive, domestic information technology marketplace in Canada free of interprovincial trade barriers, unless there is a compelling public interest to the contrary. It also endorses federal regulation of major telecommunications carriers and an active advocacy role by the Ontario Government in the provincial interest.

Thrust 3. Investing in People

In the information society, people are pivotal. If there was one issue which repeatedly arose throughout the process, it was the important role of people. Without a change in our approaches to education and training, the light at the end of the tunnel will be a train.

To address this chronic and acute crisis in education, the Committee proposes several initiatives. These initiatives can be summarized as learning for telecommunications and telecommunications for learning.

The Committee recommends establishing an education and training strategy to meet the knowledge requirements of workers in the information technology industries. This strategy must be multi-faceted. It should aim to raise skill levels of high technology managers and marketers, and help skilled and professional staff stay current in their fields. It must address the needs of the telecommunications and information technology staff in user organizations as well as those in the companies in the sector. It should also serve to enlarge the pool of science, technical and engineering graduates. The Committee further recommends that Ontario create a "Telecommunications Institute" to provide one-window access to the various telecommunications education and training programs in the province.

To encourage the use of telecommunications as a tool for learning, the Committee recommends investigating the viability of a "virtual university" for Ontario. An electronic university such as this could deliver degree programs and specialized education to the office, laboratory, home or workplace. The Committee urges public and private sector

organizations to increase their use of telecommunications, computer and video facilities to deliver education and training.

Thrust 4. Helping Communities Develop

Many of the Committee's recommendations are designed to assist universities, company head offices, telecom manufacturing complexes, significant social services infrastructures and the like located in larger Ontario cities. Smaller communities will also benefit from the thrusts mentioned so far. But the strategy offers unique opportunities to transform social and economic life in small and remote communities, as well as in non-geographic communities of interest.

Telecommunications can draw people together because it makes distance inconsequential. Using telecommunications to put people in touch with each other will help communities to develop. It can make a key contribution to moving all of Ontario towards the Ontario Information Infrastructure.

To help enhance the social, cultural and economic development of all types of communities in the province, the Committee recommends that Ontario encourage and support community networks. These will play a crucial role in our information highways of the future. Support could include incentive funding to set up telecommunications networks that meet local needs and interests. The Committee also recommends establishing a municipal telecommunications pilot project to show how telecommunications can support economic development and strengthen community infrastructure, especially in Northern Ontario.

Thrust 5. Government as a Model User

The Ontario Government, like the province itself, is at a turning point in its transition to an information society. An important and useful role for the Ontario Government is to take the lead in exploiting the enabling effect of technology to reinvent itself. This approach will produce several benefits. It will improve the efficiency and effectiveness of internal operations, promote demand for telecommunications goods and services, and support an overall provincial telecommunications strategy.

Achieving these goals demands a thorough and critical evaluation of government operations. In so doing, the Committee suggests the Government adopt a three-'R' approach — reshape, retool, and restructure. Reshaping involves applying telecommunications to reduce long-term costs and improve government service delivery. Retooling requires moving beyond telecommunications to develop an overall information policy and information technology architecture for government. Restructuring entails analysing how best to organize government to provide leadership and management for information technology.

Thrust 6. Ensuring that Technology Serves People

While new technologies offer extensive opportunities for positive change, they also pose new challenges. The Committee firmly believes that the benefits to society will be limited if individuals cannot cope effectively with the transformational effect of technology. We must not permit an "information elite" to develop in Ontario.

To secure the benefits of new technologies for all Ontarians, the Committee recommends that the Government take the lead in the development of an information policy which enunciates broad principles regarding the social and economic value of information. In a similar vein, the Committee urges the Government to develop guidelines that balance access to information with the protection of personal privacy. Finally, the Committee advocates broadening the definition of basic telephone service over time to include such features as digital service by choice and a growing menu of information services.

Ensuring the Future

This document represents both an end and a beginning. It marks the end of the process of developing the contours of a telecommunications strategy for Ontario. But it signals the beginning of the real work of realizing that strategy.

If we fail to provide effective leadership for the transformation to the new economy, we will be left far behind as a society.

Just as the Advisory Committee and the development of this report has been a participatory process among a large number of partners who have a stake in the future of telecommunications in Ontario, so must there be ongoing leadership and a partnership approach to ensure the achievement of our vision for the Province through telecommunications. The Advisory Committee recommends that the Government of Ontario, as a priority, establish a Council for an Ontario Information Infrastructure to act as an ongoing champion and campaign team for the provincial telecommunications strategy.

When the Advisory Committee reviewed an early draft of this report, several members received enthusiastic support when they urged a strengthening of the sense of urgency in this document. And it is truly a matter of urgency that we as a society, find the will, the resources, and the ways to work together for success.

We launch the Campaign for an Ontario Information Infrastructure in the spirit of enabling Ontario and Canada to succeed at economic renewal and beneficial social transformation.

Canada has many advantages. We are good at telecommunications. We are leaders in telecommunications research and development. We have or can develop anything it takes to achieve the vision. But we must focus and marshall our forces. With our competitiveness, economic health and quality of life on the table, the stakes are high.

Chapter 1

ONTARIO AT A TURNING POINT

This report is about opportunities. It is about opportunities to use telecommunications for economic growth, and job and wealth creation; in fact, to use telecommunications as a catalyst for the transformation to a knowledge-based economy. It is about opportunities to develop a dynamic, growing telecommunications sector — enabling growth in other sectors but creating jobs and wealth in its own right. It is about achieving a better quality of life through the innovative application of telecommunications. And, it is about opportunities to employ telecommunications for better access to government services and more efficient government operations.

This report is also about perils. Ontario and Canada are in danger of falling behind if we do not take decisive action. Ontario is at a turning point in the evolution to an information society and to a knowledge-based economy. We can continue to do business as usual and, while others seize the opportunities, fall further behind. Or we can, as this report proposes, take action to seize the available opportunities and in so doing achieve, through the enabling effects of telecommunications, a vision of Ontario, and in turn Canada, as the best place in the world to live, work, learn and do business.

Transformation to an Information Society

How can telecommunications help in achieving such a vision? How can it assist in overcoming Ontario's economic problems, its dependence on traditional resource-based and manufacturing activities? How can it redress some of the social problems that beset the province? And, how can it assist in achieving more effective and efficient government? The answer lies in how Ontario approaches the evolution to an information society an evolution in which telecommunications will play a critical role.

From time to time, society undergoes changes that represent discontinuities with the recent past. A new order is established which, after a time, gives way again to fundamental changes and a new cycle of events. The mid-1980s through the 1990s represents one of these turning points; a transformation to what is called the information society. It is characterized by major technical, economic and political changes. Such developments are seen as transformational, in terms of fundamental changes to society, and structural, in terms of industrial and organizational change.

Fundamental shifts in human behaviour and organizations have been spurred in the past by technological change. Earlier in our history, society was largely based on agriculture; physical labour was the primary vehicle of production. New technologies were developed which enabled the expansion of physical effort, freed up capital and labour for other activities, and ushered in the industrial age. The technologies and the processes that accompanied this transformation —- advanced engineering, the scientific method and management sciences —- permitted the efficient and cost effective production of goods and services. As a result, productivity in manufacturing, farming, mining, construction and transportation increased 45 fold over the past 120 years.

The survivors of the agricultural age were those who learned to adopt and adapt the new technologies and methods. The new entrepreneurs of the industrial age were those who seized the opportunities to develop new approaches, processes, products and services.

Central to the transformational and structural changes leading to the information age are rapid advancements in computers and telecommunications. Advances in computers which have extended intellectual capabilities, advances in telecommunications which have extended intellectual reach; a synergistic relationship whose whole is much greater than its parts. Together these two technologies form what is generally referred to as information technology; the key element of the information society. As before, those who adopt and adapt the new technology, will succeed; those who don't will be swept away. The new entrepreneurs will learn to create entirely new ways to enrich and enliven the human experience.

The transformation we describe does not mean abandoning the resource-based and manufacturing activities that constitute a large part of current economic activity. Instead of one set of activities replacing the other, the new age adds to and transforms the previous one. Agriculture and industrial production should not be abandoned but instead "informationalized." To succeed, businesses and other organizations must use computers and telecommunications to be more productive, to stay in better contact with their customers and suppliers, to offer new information-based services, and to tie internal working groups more closely together. Thus, the Advisory Committee believes that Ontario and Canada should apply information technology to our traditional sectors of economic activity. In fact, while information technology may be the engine of growth in the new age, this growth would not be possible without the sustaining support of the "goods-producing" sector of the economy.

Emerging from the worst recession since the 1930s, Ontarians face a new set of rules of engagement in trade, technology and investment. At stake are the standard of living and resulting quality of life. But is Ontario simply in the midst of a traditional economic cycle? Or, as Toronto economist Nuala Beck states, are we entering the first phases of a "new economy": a new economy described as knowledge and technology-based? (Nuala Beck & Associates Inc., "The New Economy," Toronto 1992.)

The concept of a knowledge-based economy is becoming widely understood. For example, the May 1992 report of the Information Technology Sector Advisory Committee on Prosperity Through Competitiveness formed by the Information Technology Association of Canada, the Canadian Information Processing Society and the Canadian Advanced Technology Association proposes a new national dream: "A Knowledge-Based Canada:"

> We must make every industry a knowledge-based industry. We must also find ways to accelerate the information technology (IT) sector as one of the few economic sectors positioned for continued job and wealth creation. It is also the sector which will, through the enabling effect of IT, spur prosperity in other sectors. (Information Technology Sector Advisory Committee on Prosperity Through Competitiveness, "A Knowledge-Based Canada: The New National Dream," May 22, 1992, pp. 2-3.)

An April 1992 document entitled "Towards an Information Technology Agenda" prepared by Industry, Science and Technology Canada also indicates the importance of information technology to Canada's future. The vision presented in that document is one of "information-based prosperity." Part of achieving that vision is to "Push effective economy-wide adoption of IT and the realization of its full productivity enhancing potential" and "Pursue telecom world leadership as both an industry and an infrastructure."

Other provinces are also exploring similar ideas. For example, the concept of an "innovation-driven" economy for Alberta has been investigated by the Banff Centre for Management. The Government of Newfoundland and Labrador has also explored an information industries strategy.

The Advisory Committee strongly believes that Ontario's economic prosperity lies in the transformation to a knowledge-based economy. But, as Advisory Committee member Heather Menzies stated in a recent presentation, no one can predict what the post-industrial political economy will look and feel like. We know only that its foundations are information in general and information technologies in particular. As she further stated, information technology is creating the infrastructure for a world society and a world economy, functioning globally not only on a daily but on an instantaneous basis. As that infrastructure becomes more flexible it will become more invisible. As it becomes invisible, this will paradoxically signal its maturity not just as a means to the end of transactions and other social interactions, which is the role telecommunications played in the industrial age. Information systems will become the setting, or the context, in which people live out more and more aspects of their lives. Locally and globally, they will become the medium through which and in which people do their work, and conduct their affairs with government departments, banks, and even libraries, book stores, educational institutions, and film-video distribution centres.

The synergistic relationship between computers and telecommunications which we referred to above stems from the shift to digital communications. Essentially telecommunications has adopted the fundamental language of the computer, resulting in the convergence of the two technologies. This convergence leads to a broader definition of telecommunications than was usual in the past. In addition to the familiar telecommunications products and services, it includes such elements as intelligent networks, online databases, interactive imaging and video capabilities, value-added services, electronic mail, electronic publishing, smart telephones and a host of other products and services based on telecommunications and incorporating the capabilities of the computer. Software development and applications are integral to both computers and telecommunications.

The convergence that we refer to is actually much larger, encompassing consumer electronics and media and publishing as all sorts of information is converted to digital form.

As stated in a May 25, 1992 Business Week article: "Everything from high-definition TV pictures to local phone calls will be reduced to the zeros and ones that computers already use."

Defined within this context, the impact of telecommunications is substantial. It enables access to remote databases and other information sources, it enables just-in-time inventory control, it enables the development of marketing networks and permits firms, whether large or small, to have a global reach. It permits researchers to collaborate with colleagues around the world. It extends access to intellectual, cultural and entertainment resources. It breaks down political and economic barriers. Clearly telecommunications and more generally information technology can have substantial transformative effects.

Over recent years, a fundamentally different style of computing has also emerged: from host-based to network-based. The large host computer supported by a network of local or remote terminals has given way to network computing. The new approach was driven by the arrival of the personal computer and distributed computing —- the concept of moving some of the computing resources out closer to the operational areas of the business. The new approach provides the potential for access to a wide range of data, applications, and computing resources without concern for where they are or how they are connected.

Supporting this shift is the transformation of the terminal from relatively unsophisticated devices to multi-function computers. Where required, these devices can encompass considerable computer intelligence and represent a key aspect of the convergence of computers and telecommunications.

The shift from the old to the new technology has been facilitated by a move from vendor-proprietary to open systems standards. Occurring in both software and telecommunications, a synergistic effect is felt in the development of information technology. Open systems results in information and software being portable —- that is, run on different hardware regardless of size or brand. Such standards also enable different systems to communicate with each other. Open systems are essential to create the modular, flexible, powerful, networked computing architecture required in the new business environment.

Software development in this environment has itself moved from being a craft, highly dependent on the skills and creativity of the individual, to a standardized or "engineered" approach. Computer Aided Software Engineering tools are now showing their potential to radically improve the way software is created. The potential for "repositories" of software arises from this approach, facilitating the reuse and value-added development of software capabilities.

The move from narrowband to broadband transmission capability, the development of standards, the adoption of digital transmission and the advent of increasingly intelligent network devices and terminals combine to enable the integrated provision of voice, data, image and video communications. The advent of the multi-media terminal is a product of these combined capabilities.

Finally, the intelligent, high-bandwidth network that these changes in technology permit, and the development of mobile and personal communications devices, may change the user's view of the network even more. The network will eventually evolve to an addressing scheme that is person centred rather than location dependent. Thus, rather than calling a "telephone number", the network will in future transparently call a person regardless of location or type of communications device.

The transformation to an information society is not simply a matter of technological advancement. A number of fundamental changes in the business environment, enabled by information technology, stimulate the transformation and further drive the demand for telecommunications products and services.

A key characteristic of the new environment is the need for improved productivity; that is, organizations need to significantly and continuously improve productivity in order to survive and prosper in the open, competitive, global marketplace. Information technology, and, of course, its telecommunications component, is the foremost tool at the disposal of organizations.

Quality requirements, tied to integrated production processes and such processes as just-in-time inventory control, also drive demand for telecommunications products and services. Quality encompasses consistency, predictability, employee motivation, supplier involvement and performance measurement, all a part of and enhanced by telecommunications.

The need to respond quickly to market conditions, competitive threats and customer demands are other hallmarks of the changing environment. Organizations, whether situated in rural or remote areas or in urban centres, must respond quickly and effectively to marketplace requirements. It matters not that the customer may be across the city or on the other side of the world.

Another common theme is globalization of markets, operations and competition. Operating successfully in a global marketplace requires cost effective, reliable and accessible telecommunications facilities.

Many firms are realizing that they have neither the resources nor the time to capture the new opportunities by acting alone. A new "extended enterprise" is emerging which seeks strategic advantage through new kinds of relationships with suppliers, customers, affinity groups and, in some cases, competitors. Partnership arrangements are being established that involve research and development consortia, joint ventures and cross-licensing arrangements. These partnerships, highly dependent on telecommunications, enable firms to enter new markets, share financial risks and generally to act more quickly and decisively.

As information technologies allow organizations the ability to integrate external suppliers into their production processes, there is also a growing trend towards off-loading or outsourcing previously internal functions. This allows organizations to focus on their key areas of value-added capability and, in so doing achieve new levels of productivity. However, it also raises labour issues which must be addressed.

The new enterprise must act responsibly in its relationships with others, both inside and outside the organization. In particular, customers want to purchase goods from companies that are ethical, good corporate citizens and environmentally responsible. Also, in the new business environment, employees, the key to success in a knowledge-based economy, must be empowered and motivated to cooperate for success. This means that employees expect fair treatment, some control over decision making, a stake in the success of the group and the enterprise, and the proper tools to do their jobs and collaborate effectively. In general, this also means a commitment to training and retraining on a continuous basis.

Economic Renewal, Wealth and Job Creation

Telecommunications can have a fundamental role in shaping Ontario society and addressing the priorities of government. These priorities include economic renewal, wealth and job creation; social development and a sustained quality of life; and effective and efficient government operations and deficit reduction.

The 1992 Ontario budget recognizes the importance of new technologies specifically for the global economy, and for Ontario's role in that economy:

> Changes in information technology (including micro-electronics, telecommunications and computers), material science, biotechnology and other fields have made possible a broad range of new goods and services. Computerization and other information technologies, in particular, have also allowed for radical changes and productivity improvements in the production of goods and services throughout advanced industrialized economies.
>
> Increasing productivity depends on expanding innovative activity throughout the economy. Changes in the international division of labour in the global economy create the possibility of, and the needs for, a reorientation of production in Ontario toward activities that rely on continuous innovation. Comparative advantage in the past has often relied on physical endowments such as a country's resource base. By contrast, comparative advantage in technology-intensive activities can be created by firms and governments. The Government of Ontario is committed to supporting the development of these advantages — both for Ontario firms in new technology-intensive sectors and through the application of technology to existing products and processes. (Ministry of Treasury and Economics. "Investing in Tomorrow's Jobs: Effective Investment and Economic Renewal," Supplementary Paper 1992 Ontario Budget. [Toronto], pp. 11, 14.)

We outline below some of the possibilities for using telecommunications to address government's priorities and concerns. Telecommunications, as indicated by example from various jurisdictions, including within Ontario, can be both the enabler and the driver of change.

Telecommunications as an Infrastructure for Economic Growth

Virtually every sector of the economy is increasing its use of telecommunications products and services, as more and more firms view telecommunications as their means of gaining a competitive advantage over their domestic or foreign rivals. There is significant demand originating from major changes in the way we live and do business. While the demand for telecommunications products and services has been substantial, the potential is almost unlimited. One of the keys to this growth is the "infrastructure," comprising the entire apparatus of hardware, services, standards, software, etc., considered as a functioning whole. A modern, advanced telecommunications infrastructure is necessary to promote economic growth and to enable Ontario to become more competitive.

Now is a critical period in which wise investments must be made in revitalizing the telecommunications infrastructure, fostering new information technology-based companies and in ensuring that the necessary human resources are being developed. At the same time, an effective distribution of the capabilities of the telecommunications infrastructure can bring new opportunities to all types of communities and organizations throughout the province.

The possibilities for using telecommunications as a resource to support economic growth are substantial. They range, for example, from supporting northern and small community growth, to supporting research and development in order to enhance competitiveness, to providing the high-speed communications highway which will be the cornerstone of future economic activity.

Imaginative uses of telecommunications can bring new economic opportunities to Ontario's northern, remote and rural communities. This can be achieved, for example, by supporting existing industries to become more effective and competitive through better access to technical, management and market information. It can also be achieved by the formation of new businesses that take advantage of the opportunities to use telecommunications to operate in these areas. In fact, as we have noted, telecommunications has the potential for making many such economic decisions independent of geographical location and distance. For example, a submission from Atikokan in northwestern Ontario states that the "information economy" should be recognized as the current economic driver. The submission emphasizes that competitive advantage no longer belongs to regions or countries with the most abundant natural resources, or even the most capital. Government, it argues, should view the telecommunications infrastructure as an economic development tool, particularly for resource-based or single industry communities. A submission from the Ontario Corn Producers' Association equally emphasized the importance of telecommunications to agriculture.

Others have recognized the ability to use telecommunications to spur economic development, particularly in rural and remote areas. For example, the Government of Newfoundland and Labrador has initiated the "Enterprise Network" a communications and database network designed to promote and support small business start-ups throughout the province. New Brunswick and Nova Scotia are actively promoting and developing new telecommunications-based business activities. Various U.S. communities have also aggressively pursued opportunities based on the availability of a supporting telecommunications infrastructure. For example, Sioux Falls, South Dakota attracted Citicorp's credit card processing and reporting operations with its high quality telecommunications system. Similarly, TRW located a steering wheel manufacturing plant in Tellico Plains, a rural community in eastern Tennessee, based partially on the local telephone company's willingness to install new digital switching equipment.

A number of leading industrialized nations have established education and research telecommunications networks in the recognition of their strategic contribution to the long-term economic competitiveness of their countries. In the U.S., the Federal Government recognized this by approving in late 1991, the $US 2 billion High Performance Computing

and Communications Program to "sustain and extend its (U.S.) leadership in all areas of computing and networks". Under this program, the U.S. government will invest almost $US 400 million, over five years, to upgrade its National Research and Education Network.

National Research and Education Network (NREN)

"The vision of the NREN is of an interconnection of the nation's educational infrastructure to its knowledge and information centers. In this system elementary schools, high schools, two and four year colleges, and universities will be linked with research centers and laboratories so that all may share access to: libraries, databases, and diverse scientific instruments such as supercomputers, telescopes, and particle accelerators."

Source: FY 1992 U.S. Research and Development Program, Grand Challenges: High Performance Computing and Communication

Singapore's National Information Technology Plan

"[Singapore's] Information communications infrastructure is the backbone of our information-based economy. We must continue to have the best telecommunications facilities in the world to maintain an advantage in the Information Age".

Source: "The Global Impact: Telecommunications as an Enabler of Economic and Social Development," Bell Ontario, May 1992, p.36.

In Canada, a similar initiative, referred to as the Canadian Network for the Advancement of Research, Industry and Education (CANARIE), is being investigated by the federal, provincial and territorial governments, the industry, the academic community and the existing networking operators. It is considered necessary to enhance Canadian national research and education network capabilities, particularly to operate at higher speeds and to stimulate the industrial benefits that can flow from high-speed networking. ONet, the current relatively low-speed Ontario research and education network that interconnects to CA*net, the current national network, supports research and educational activities in the province.

Two countries in particular have undertaken economic development through comprehensive telecommunications strategies. In March 1990, Japan announced a national plan for a fibre optic network capable of transmitting complete multi-media services to homes and businesses by 2015. In 1986, Singapore adopted the National Information Technology Plan, a comprehensive approach to the development of information technology. As a result of an exemplary government-business partnership, Singapore Telecom has upgraded its network and supplied its network customers with the most advanced facilities available.

Modern, value-added services will be important to all aspects of business in Ontario. Take, for example, the role of electronic data interchange (EDI), defined as "the standards-based computer-to-computer exchange of inter-company business documents and information." A June 1992 Supplement to the Globe and Mail entitled, "EDI or DIE" indicates that approximately 30,000 out of an estimated six million companies in North America have started doing business electronically. In Canada, more than 600 companies have joined the EDI Council of Canada. These companies believe that EDI will make them faster, leaner, more error-free, and more efficient. Many of these companies consider that they have little choice but to adopt EDI; their international competitors are up and running. EDI requires rethinking the way business is conducted. Essentially it means getting rid of paper and relying on the transfer of electronic records.

EDI is also used by government. Revenue Canada, Taxation for example, is using EDI with Canadian financial institutions so that they may accept payment of tax and to capture and electronically transmit information to Revenue Canada. EDI pilot projects are also underway in other Federal Government departments. Customs and Excise has a system that will clear shipments before they land on Canadian soil. The Department of National Defence has a project to automate the procurement of fresh meat, poultry and fish.

The telecommunications infrastructure is also important to the service sector. Ontario's tourism industry, for example, is looking to telecommunications to improve its competitiveness. The traveller of the 1990s demands fast, efficient and effective service and a one-stop-shopping approach to planning vacations. Since the spring of 1991, a group of tourism industry representatives has been working with the Ontario Ministry of Tourism and Recreation on the development of a Central Reservation and Information System for Ontario. The system is expected to greatly increase economic returns to the tourism industry through increased occupancy and provide enhanced customer services as well.

Japan Plans Nationwide Fibre Optic Network

Japan's drive toward the creation of a national fibre optic network is the result of national policy. It must be seen in the overall context of positioning their manufacturers to take full advantage of the global market they believe will develop for broadband communications.

The Role of the Telecommunications Industry

Telecommunications services, in spite of the rapid movement towards liberalization, remains a highly regulated sector. As users and carriers have sought to take advantage of the opportunities provided by telecommunications and computer technologies, unprecedented pressures have been placed on governments in their role as regulators to respond with more flexible arrangements that facilitate the provision of new services, new carriers, and new structure.

GM Canada Makes EDI a Criterion for Doing Business

As the country's largest and most highly integrated manufacturer, General Motors of Canada processes thousands of EDI transactions each day. GM sees many advantages: • It's cost-effective: an EDI transaction costs only 13 cents. • It's fast: EDI eliminates five-day mailing time for business documents. • It's reliable: transaction acknowledgements help ensure the delivery of information. • It's flexible: EDI transactions are not restricted to a paper form - information may be added as required. • It's expandable: additional transactions can be easily added. For GM Canada, EDI makes good business sense. For their suppliers, it makes the difference between doing business and going out of business.

Source: Supplement to the Globe and Mail, "EDI or DIE," June 1992, p.15.

Regulatory organizations in many developed countries, have moved towards new policies and regulatory approaches that emphasize greater dependence on market incentives to promote economic development. Considerable differences between jurisdictions remain, however, in the rapidity with which competition, privatization and liberalization have been embraced. In fact, with the rapid liberalization of telecommunications in the United States, the United Kingdom and Japan, international differences in regulation, policy and pricing have grown in many respects. With the growth in international interdependence and trade in telecommunications and computer services, such interjurisdictional differences have the potential to

complicate the international trade relations regarding telecommunications and other related services and products.

The global telecommunications industry has traditionally been characterized by extensive government intervention and less reliance on free market principles than the other components of information technology. Many jurisdictions around the world provide telecommunications services on a monopoly or near monopoly basis. In addition, a local manufacturing presence or licensing arrangement has often been required in selling equipment to the national telecommunications carrier. Recently this environment has begun to change. Countries such as the United States, Japan, the United Kingdom, Australia and New Zealand, have introduced competition and begun to deregulate their telecommunications industry. In part due to these trends, telecommunications companies have started to expand globally. Market opportunities also arise from the globalization of business generally, particularly through the emergence of major trading blocks and the development of free-trade zones. The relationship is, of course, synergistic, since the availability of greater choice and innovation in global communications leads to further globalization.

Canada has followed the trend to greater competition in the provision of telecommunications services, albeit somewhat more slowly in some aspects than the leaders in this area. Over the past number of years, decisions by the Canadian Radio-television and Telecommunications Commission (CRTC) and various provincial regulators, the most far-reaching of which being the June 1992 CRTC decision to permit competition in the provision of public long distance voice telephone services, have increasingly opened the telecommunications industry to competition.

Ontario's service providers, with the support of the CRTC and the Ontario Telephone Service Commission (OTSC), have made major commitments to building and modernizing Ontario's telecommunications infrastructure. Ontario's telephone companies, including Bell Canada and 31 other smaller telephone systems, provide basic telephone service to 99% of the population, one of the highest telephone service penetration levels in the world. The modernization of Ontario's network is ongoing, particularly digitization of the telephone network. Ontario's cable television companies provide a broadband infrastructure which is available to almost 75% of all homes in the province, primarily to deliver video entertainment services. Plans call for a wide range of new services and the ability to provide an addressing capability to individual customers. Cellular telephone service is widely available throughout the province. Ontario users also have access to a wide range of satellite facilities and services. The sector is also composed of a number of competitive suppliers including resellers and value-added services providers.

In 1990, Ontario telecommunications equipment firms sold about $3.6 billion worth of equipment, almost 60% of total Canadian shipments. This part of the sector employs over 33,000 people and accounts for about 25% of total provincial research and development. The sector delivers a net trade surplus in equipment.

Ontario's telecommunications research and development sector plays a major role by maintaining the industry at the leading edge in technologies and services. The sector achieves this by a strong collaborative effort involving business, government and universities.

An example of such collaborative effort is the Ontario Telepresence Project. The project was set up to help accelerate the development of Ontario's capabilities and opportunities in the marketplace emerging from the convergence of telecommunications, computer and audio/visual technologies. The project exists under the auspices of two Ontario Centres of Excellence: The Information Technology Research Institute (ITRC) and the Telecommunications Research Institute of Ontario (TRIO). The research is primarily coordinated from the University of Ottawa and the University of Toronto. Technology transfer takes place through the direct and active participation of partners in the planning and execution of the research. Such participation is facilitated through the accommodation of industrial researchers on campus and the use of telepresence technologies to enable collaboration at a distance. The project has an international component to the research. Ontario has an association with four regions, known as the Four Motors of Europe. These are, Baden-Wurttemberg (Germany), Catalonya (Spain), Lombardia (Italy), and Rhone-Alpes (France). This association has collectively decided to undertake joint research in Telepresence, and the Telepresence Project is the Ontario part of that agreement. The main contribution of the European partners will be in applications, especially telemedicine and distance education. Current plans are for the Europeans to base their work on the technology developed in Ontario. Communication with the European partners is expected to be, in part, via services donated by the federal Department of Communications, using the experimental Olympus satellite.

Social Development and Sustained Quality of Life

The enabling effects of telecommunications extend to a wide range of societal concerns, activities and issues. Telecommunications has the potential to allow everyone in Ontario to have immediate access to a range of emergency and health services, on-line education and training resources, access to library catalogues and collections, one-stop shopping for government information, and a wide range of information-based products and services.

Applications and services on the advanced telecommunications networks of the near future also extend to new ways of doing things such as extensive environmental monitoring in real-time, reorganization of work including telework, and enhanced entrepreneurship and business networking through identifying groups and individuals with common interests. Such advances will enhance the quality of life by enabling, for example, improvements in the environment, expanding quality time with family and friends as a result of telework, and enhancing community development and personal satisfaction through the sharing of common interests with wider groups of individuals.

Below we present a detailed discussion of three out of dozens of possible areas in which telecommunications can enhance the quality of life: education and training; health care; and the environment.

Telecommunications in Education and Training

Telecommunications has the potential to revolutionize education and training; in fact, to support life-long learning. For example, the research and education networks that we discussed earlier have the ability to permit people of all ages to access, interact with and

use intellectual resources around the world, be they specialized databases, libraries, museums, or other people.

All Canadian provinces, without exception, now provide some form of tele-education. The Government of Ontario has recognized the potential of telecommunications to reduce disparities in educational opportunities in the northern parts of the province. The Northern Distance Education Fund sponsors nine tele-educational programs aimed at enhancing secondary education in Ontario's northern communities. In 1986-87, for example, the Government established Contact North, a distance education network, to improve the accessibility to formal and informal secondary and post secondary education for residents of Northern Ontario. It enables students to take programs off campus using computers, facsimile machines, electronic classrooms, and teleconferencing.

Telecommunications can have major uses in private sector training: to keep employees abreast of changing technologies, methods, and products; to help employees adapt to changing conditions; and even, to improve employee safety. For example, Federal Express has developed a training support system — a nationwide network of 1,000 learning stations in 800 locations — to deliver interactive video instruction covering all aspects of the jobs of couriers and customer service agents.

Probably one of the most imaginative uses of telecommunications within an educational context is by the National Technological University (NTU), a non-profit consortium of about 40 universities in the U.S., that offers instructional programming in the labs and offices of participating corporations and government agencies. NTU is both an "electronic university" and a "university without a campus." It delivers credit and non-credit courses from participating universities to remote "classrooms" via satellite. These courses are designed to help technical professionals stay current in their fields of interest and broaden their management skills.

The Management of Technology and Innovation (MTI) Centre, located in Ancaster, Ontario and affiliated with McMaster University, is attempting to develop a Canadian version of NTU. MTI plans a pilot project which will involve a satellite downlink from NTU as well as from Canadian sources. MTI sees this as the first step in creating the Canadian Technology Exchange Network.

The role of Ontario's universities in the implementation of a telecommunications strategy for the province can be substantial. A submission to the Advisory Committee from the Vice-President, Computing and Communications, University of Toronto suggests that Ontario's universities can contribute as:

- developers of the telecommunications infrastructure;
- technology test-beds;
- educators in information technology;
- sources of information technology; and
- sources of intellectual capacity, including highly trained human resources.

The Advisory Committee believes that telecommunications in general can make great improvements to the quality of education and training in Ontario. And, as stated in the

University of Toronto submission, Ontario's educational institutions, with proper funding and appropriate policy initiatives, can contribute substantially to the implementation of a telecommunications strategy.

Telecommunications in Health Care

Canada's health care system is experiencing a crisis caused by growing demands and increasing costs. Telecommunications offers the potential to respond, in part, to this crisis and in so doing provide better service with existing resources. In general, the application of telecommunications to health care falls into three categories:

- supporting health care administrative and management systems;
- supporting health care professionals in the provisions of high quality care; and
- supporting the public's access to information on specific and general health issues.

Improvements in the efficiency of health care administration and management can be achieved by the application of telecommunications in activities such as: registration of clients, providers and group rosters; the submission, processing and payment of medical claims; service authorizations for non-universal services; distribution of bulletins, fee schedules and price lists; health product procurement; collection of service information for planning; and tracking facility availability. With these applications, effective use of telecommunications can greatly improve administrative and management functions while reducing costs.

The most dramatic benefits of telecommunications in health care are in the second and third categories above; specifically, to improve health care by changing the way things are done. In the area of drug care, substantial improvements are possible. A shocking number of hospitalizations and even deaths result from reactions to drugs, for example, caused by the interaction of two or more drugs. Telecommunications and computerized systems can be used to predict and alert service providers to chronic condition interactions before the patient is at risk. With a comprehensive system, this can be achieved regardless of the number of pharmacists or prescribing physicians involved. As a byproduct, drug utilization practices can be analyzed and comparative information provided to drug prescribers.

Telecommunications can significantly enhance the maintenance and transfer of medical information among service providers. For example, in emergency situations, the transfer of medical records prior to arrival of the patient can save valuable treatment time and often positively influence the outcome. Electronic medical records, shared using telecommunications, could be used to protect patients from conflicting medical procedures when seeing more than one medical practitioner. Telecommunications can also support the maintenance of various registries ranging from available cardiac beds to organ transplant availability.

Telecommunications can reduce, to a degree, the impacts of distance on health care delivery. For example, general practitioners in remote locations can obtain assistance with difficult or unusual medical problems. In addition, conferencing systems allow medical practitioners to collaborate on medical problems and issues. Such tools can also support consultations and continuing medical education. On a related basis, access to remote

medical diagnostic and treatment aids such as expert systems, medical databases, and current drug compendiums could further augment the skills of the medical practitioner.

Telecommunications can also help institute a preventative attitude towards health care. For example, it can support access to medical information directly to people on healthful living and potential health care problems through voice response systems and information "kiosks", thereby encouraging direct personal involvement in health care and lifestyle decisions.

TelecommunicatiLons, as is well known, plays an important role in emergency medical situations. The "911" system, adopted by a number of Ontario municipalities, is a well recognized application. Telecommunications can also improve health care and the quality of life for the physically disabled by, for example, the use of alerting systems. A unique application of telecommunications for use in emergency situations is provided by an antenna system for air ambulance aircraft designed and developed by the Ontario Ministries of Culture and Communications, Health, and Government Services, as well as the federal Department of Communications. The satellite-based system enables physicians on the ground to authorize paramedics onboard air ambulance aircraft to start medical treatment immediately. The time gained in commencing medical treatment upon voice contact, instead of waiting for arrival at the hospital, can prove to be a critical factor in life or death situations.

Telecommunications and the Environment

Environmental degradation poses a serious threat for Ontario and other jurisdictions. Telecommunications can alleviate the situation in a number of ways. Telecommunications has been used for some time in environmental monitoring and remote sensing dealing with the state of the environment. This will continue and likely expand. Telecommunications can enable businesses and jobs to be located in smaller cities, towns and villages resulting in less congestion in our major cities, less transportation pressure and less pollution.

On a different scale, but with similar impacts, an important trend is the use of telecommunications to enable people to work at home or at remote locations outside the office. This phenomenon, called telework, can have positive benefits on the environment. It can also have positive benefits by enhancing the quality of life, improving worker productivity and even giving rise to new forms and types of work. In fact, the physically disabled may be one group to benefit substantially from the new approach to working offered by telework. To gain the maximum societal benefit from telework, its isolating effects must also be recognized and countered.

The Benefits of Telework in the Greater Vancouver Area

A 1991 study by Stephen Finlay, Business Administration Program, Simon Fraser University, estimated that the net present value of 26,200 people telecommuting in the Greater Vancouver area as $1,768 million over the 1992-2001 period. The estimate is exclusive of the macroeconomic benefit of avoided air pollution. The public sector would receive the greatest benefit (in the form of avoided transportation infrastructure expenditures). However, benefits will also exceed costs for teleworkers and employers.

In terms of using telecommunications for the betterment of society and the environment, over 1200 organizations and concerned citizens, almost half of them in Ontario, use the electronic mail and computer conferencing capabilities of an organization called Web to network with colleagues, locally and globally,

on matters related to the environment, peace, social justice and human rights, international development, health and education. Web has attempted to get a number of projects off the ground including among others a Great Lakes Bio-Region Information Network, environmental education in schools (over 100 schools currently use Web) and a self-help network for the disabled, sick, elderly and others in need of help.

The 1992 Report of the Royal Commission on the Future of the Toronto Waterfront recommends the establishment of a research and education network for ecosystem studies in the Greater Toronto bioregion. It was noted that many information systems and databases already exist; the fundamental need is to link them together, coordinate research efforts, and make information accessible to government agencies, non-profit groups, the private sector, and the public.

Effective and Efficient Government Operations and Deficit Reduction

A critical priority for governments is the need to provide efficient and effective public services while reducing costs. Ontario is no exception. Recognizing this need, a central element in the telecommunications strategy must be to utilize the power of current and evolving telecommunications and information systems capabilities within the province to reduce the cost of government's operations while at the same time improving customer service. This can directly result in reduced expenditures, freeing funds for other services or for reducing the public debt. At the same time, there is a large opportunity for the Government to use modern telecommunications to deliver services to the public in a more comprehensive and cost-effective manner.

To achieve this will require both a strong commitment and investment in order to shift from the old way to a new way of doing things. By amalgamating services and applications, by streamlining operations and procedures and by organizing around the power and utility of information technology and telecommunications, provincial ministries can gain benefits in both the scale and scope of their operations. This also presents an opportunity, not to put people out of work, but to free up staff for more productive activities, and to improve or enhance programs and services.

Various governments have adopted innovative use of telecommunications to improve the efficiency and effectiveness of government service delivery. For example, BC OnLine, an electronic gateway service providing public and private sector users in British Columbia with direct electronic access to government information, holds the potential to revolutionalize the way in which a government organization serves society. The service initially allowed lawyers, realtors, financial institutions and other businesses, to have immediate access to several Government Registry databases such as Companies, Personal Property, and Land Titles. Access has since expanded to include the Mobile Home, Rural Property Tax, Land Tax registries, BC Assessment Authority, Motor Vehicles, and Mineral Title databases. BC OnLine represents a convenient, cost-efficient method with a single point of contact for payment, problem resolution, and account management. The service has evolved from a simple library-retrieval tool into the main gateway for the provision of government information to a growing body of users.

The Federal Government has begun to use information technology and telecommunications to improve service to the public and reduce costs. For example,

Revenue Canada has developed an open system whereby tax practitioners can transfer clients' income tax records electronically. This saves Revenue Canada the initial handling and data entry of the tax return and greatly reduces the elapsed time to process the return. Federal Customs and Excise has a pilot system which permits an importer to electronically transmit information to Customs and Excise on the contents of goods that it is importing. Customs and Excise can then decide which, if any, parts of the shipment it wants to inspect. When the shipment arrives, it is either waved through or the specific container is identified and inspected on the spot. This improves Custom and Excise's productivity and saves the Canadian importer time and money.

In Ontario, the Ministries of Transportation and the Attorney-General are implementing a kiosk pilot to deliver services related to driver and vehicle licences and fine payments. The full implementation, should it proceed, is designed to improve customer service, reduce the costs of service and position a road safety agency to generate revenue from the sale of information and network services.

The Advisory Committee was informed in one submission of the significant benefits that can arise from the development and adoption of Intelligent Vehicle-Highway Systems (IVHS). Such systems combine advanced automotive, information and telecommunications technologies to alleviate urban traffic congestion problems (by maximizing transport efficiency and reducing demand), improve road safety and reduce harmful emissions. This is an area of government-industry cooperation with many opportunities for research, development and demonstration activities as well as for the design, manufacture and marketing of new Ontario and Canadian-made products.

The initiatives described above indicate some of the possibilities for the use of information technology and telecommunications in delivering government services. These are but a few; the possibilities are enormous.

Chapter 2

FRAMEWORK FOR LEADERSHIP

Early in its deliberations, the Advisory Committee adopted a proposed strategy framework. The framework provides a context and structure for reaching agreement on the long and short-term strategic initiatives and action plans necessary for the realization of Ontario's telecommunications goals. It outlines a vision, goals and policy directions for an Ontario strategy. This chapter discusses the framework as shaped by the Advisory Committee (shown in overview in Figure 2-1). It presents the vision, goals, policy directions and implementation barriers as a precursor to discussion of strategic initiatives and action plans in the following chapter.

Vision Statement

As we indicated earlier, Ontario needs a new and shared vision of our future. In developing a vision, the Advisory Committee chose to focus on the end result of what we want to achieve rather than the telecommunications industry or technology itself.

Our vision, simply stated, is:

Enabled by telecommunications, Ontario, and in turn Canada, will be the best place in the world to live, work, learn and do business.

The remainder of this document deals with how we can use telecommunications to build the kind of Ontario that we all wish. Telecommunications, we feel, can be the enabler and the catalyst for the transformation to a knowledge-based economy, the competitive advantage of business, enhanced quality of life and more efficient and effective government for the people of Ontario.

Goals of a Telecommunications Strategy

The four goals presented in Figure 2-1 form the heart of the strategy framework. The goals present four perspectives through which we have attempted to capture the leading issues in this crucial and complicated field. The discussion which follows describes each goal area and associated policy issues and concludes with a scenario that could exist around the turn of the century if these goals are met. In discussing the policy issues, the intent is not to describe the telecommunications environment in Ontario but instead to

Figure 2-1
Framework at a Glance

focus on the issues which arose in the Advisory Committee's deliberations regarding the formulation of a strategy.

The four goal areas were respectively considered by the four sub-committees established by the Advisory Committee. In addition, roundtable discussions were held to obtain a wider range of inputs on the issues relating to the goals.

Goal 1. An Infrastructure Which Enables Economic Growth

Goal: To promote a telecommunications infrastructure which enables economic growth and will assist Ontario in becoming more competitive.

This goal recognizes the enabling role that telecommunications can play in transforming Ontario's economy. The goal is to develop a telecommunications infrastructure which enables the incorporation of knowledge-based activities and functions into all economic activities and supports a globally-competitive, knowledge-based economy. To achieve this

goal the Advisory Committee proposed three main policy directions:

1. State-of-the-art networks;
2. Innovative and affordable business services; and
3. Active and informed users.

There is a strong interdependence between each of the policy directions. Input from informed users, in part, drives the evolution of services and networks. Information on network capabilities, and the range of possible services, is required by users in order to conceive of applications which meet their business (and other) needs, and thus to formulate their demands as clearly as possible.

Telecommunications infrastructure development under a monopoly industry structure has been essentially determined by carriers subject to regulatory oversight and review.

A market-driven approach to infrastructure development is essential to this goal and it will become more important as a result of regulatory and policy decisions that increase the role of market incentives in determining technological and investment priorities and decisions. However, this approach on its own is often limited by the fact that users normally ask for more of what they already have and rarely ask for completely new services and applications. This is in part because users do not seek out information on technology trends which are not already reflected in products and services and because suppliers often do not provide such information effectively to users. As a complement to the demand side, supply-driven investments in telecommunications infrastructure, applications, services and products should be encouraged and undertaken as part of longer term investments. The best of both worlds is achieved by a telecommunications strategy which is primarily market-driven and also encourages and supports technology-driven entrepreneurial activity.

State-of-the-Art Networks

An important aspect of the telecommunications infrastructure is the design and operation of networks that permit efficient, integrated transport of voice, data, image and video traffic throughout the province. Ontario is well positioned in network development. A multiplicity of common carriers and reseller networks are available, most employing digital switching and transmission. Common channel signalling, which will allow the deployment of advanced services and features, is well advanced. Cable television networks provide a broadband one-way, point-to-multipoint capability to a high percentage of homes in the province. Fibre optics is used extensively by carriers and cable companies, particularly in the core elements of their networks. Satellite networks are available which serve business and government, and complement terrestrial networks. In addition, a number of radio-based mobile services are available, particularly cellular telephone service, which respond to mobile communications requirements. As we move into the future, however, an important challenge will be the development and operation of cost effective, state-of-the-art, high-quality, interoperable networks that permit efficient, integrated transport of voice, data, image and video communications over common facilities. Such interoperability is needed to respond to users' requirements to access information or people regardless of where they are located. At present, there are significant technical challenges in interconnecting different networks (e.g. satellite, mobile radio, cellular, terrestrial carriers' networks, etc.) in order to operate in a transparent fashion. There are

few agreed-on standards for network interoperability. A current challenge, for example, is to have common channel signalling capability among these networks.

Innovative and Affordable Business Services

The pricing of basic telephone services in Canada is a result, to a substantial degree, of regulatory policies towards the goal, now essentially achieved, that these services be universally affordable and accessible.

If Ontario businesses are to compete successfully they must have available the latest in telecommunications services at affordable prices. A key challenge is to stimulate innovative new services and service suppliers. The issues raised with the Advisory Committee in this policy area indicate a major concern in the business community with regard to the availability and pricing of business telecommunications services. In particular, many Canadian firms are being challenged by global competition. Their non-Canadian competitors can often operate more effectively because of lower long distance rates. Some of the innovative telecommunications services that would allow firms to compete on a global basis are not yet available in Ontario, or are only available in some locations and at higher prices than many users can afford. Furthermore, in part as a result of U.S. regulatory policies promoting rate restructuring and interexchange carrier competition, the prices for many services remain substantially higher in Canada than in the United States. This inhibits their use, which in turn inhibits investment in application development. It also acts as a brake on Canadian firms' competitiveness, because they are inhibited from using services which make their U.S. competitors more effective. The recourse for some users has been to bypass Canadian suppliers and use network services available in the United States.

The absence of competition in the provision of many services, along with long distance prices that are artificially high — in the view of many users as well as providers — limits the range of services available, the speed at which they are introduced, and their affordability. The June 1992 CRTC decision to permit competition in the provision of public long distance telephone voice services and the extension of resale may alleviate some of these concerns. Regulatory approval for new services has often taken much longer than users or suppliers would like. Users and suppliers would like a streamlined approach to approval of new services subject to the regulator's tariff approval requirements. Users would also like a single regulatory environment across Canada for major carriers, so that the rules, services and pricing structures are uniform. Thus, government, users and suppliers should actively participate in telecommunications policy and regulatory issues to support consistent national standards in order to promote the introduction of new services and facilitate the development of a national market.

Active and Informed Users

Active and informed users are needed to take full advantage of the potential opportunities and to stimulate the growth and provision of new services. The full range of applications which technology makes possible cannot be developed without input from informed users. The sheer availability of innovative telecommunications services, whether directed at the business or residential customer, cannot by itself ensure that the user will take full advantage of what is available or take an active part in service development.

While Ontario has many relatively sophisticated telecommunications users today, the issue is how to stimulate the added level of sophistication needed for the transition to a knowledge-based economy. Even now, "keeping up" with the exploding range of technologies, services and applications is one of the biggest challenges facing users. Ways must be found to close the awareness gap, particularly for small business, on what telecommunications can do to improve efficiency and effectiveness.

Goal 2. A Dynamic, Growing Telecommunications Sector

Goal: To promote the growth of all aspects of Ontario's telecommunications sector, including manufacturing, services and research and development.

This goal recognizes the substantial contribution that the telecommunications sector in its own right can and does make to Ontario's economy. It is one of the few advanced technology areas in which Ontario has world class capabilities. There is also a recognition that the goal of a dynamic, growing sector is essential to meeting the many challenges Ontario will face in the transition to a globally-competitive, knowledge-based economy.

Canadians are good at telecommunications. We already have one of the finest telecommunications networks anywhere, we have cable television coverage as extensive as any other country in the world, we have a supply industry which is recognized around the world, and in this sector we have by far the greatest Canadian industrial research and development resource. We have a Canadian success story.

But the field is moving rapidly. New technologies challenge our innovators to produce more capability with fewer resources. New applications of distributed information systems create opportunities for value-added services. Telecommunications-based services are a major opportunity area for the future. The supply industry has become global in its markets, in its challenges and in its competition. And our carriers must cope with bypass via private networks while adjusting to the new environment of competition in Canada. Past successes are great to contemplate — but not for long. Innovation has become the watchword of the industry.

Members of the Advisory Committee proposed meeting this goal through the following policy directions:

1. Enhanced growth in telecommunications equipment;
2. A growing value-added service industry;
3. Internationally competitive carriers; and
4. A strengthening of research and development and innovative applications.

Enhanced Growth in Telecommunications Equipment

Manufacturing is important to the economy of Ontario. While it is true that the services sector of the economy has grown dramatically over the past two decades, there is no evidence that trade in services alone will be sufficient to pay for Canada's imports. It is worth noting that Canada is very dependent upon trade — fully 30% of our gross domestic product is trade dependent. That is a much higher percentage than for the U.S., Japan or, indeed, for any of the countries with which we compete. Trade is particularly critical for

telecommunications equipment suppliers. The Canadian domestic market is too small to generate the production economies necessary for global competitiveness. The consequence is that most Canadian suppliers can exist only if they compete internationally and have significant export sales.

This raises two issues that were brought to the attention of the Advisory Committee. The first is that Ontario is a high cost production area. As a comparison, an estimate was made of the cost of production at equivalent plants in Ontario, in the Southern U.S. and in Mexico. Ontario firms produced average after-tax profits of 6%, U.S. firms, 8% and Mexican firms, 10% The conclusion is that manufacturers in Ontario cannot compete solely on cost; they must compete on product differentiation, quality, service, reliability and overall value. That puts particular pressure on Ontario companies and particularly the staffs of large multi-plant companies. With regard to the latter, the most critical competition is from the U.S.-based plants of the same company. In Northern Telecom, for example the Bramalea switching plant is large in Canada, but smaller than its sister plant in Raleigh, North Carolina with which it often competes for work.

The second issue relates to access to the Canadian telecommunications equipment market. The Advisory Committee was presented with differing perspectives on this issue. Many small suppliers were of the opinion that a special supply agreement between Bell Canada and Northern Telecom largely excludes their access to Bell Canada, leaving them only the smaller telephone companies as potential buyers in Canada. The spectre of almost total exclusion from the domestic Canadian market was also raised, by virtue of a postulated extension of the Northern Telecom supply agreement to other members of Stentor Canadian Network Management. The Advisory Committee was also apprised of the positive aspects of the Bell Canada-Northern Telecom relationship in terms of network modernization, research and development, employment, new services and global competitiveness of Northern Telecom. The Committee was advised that there is no intention to create a closed domestic market amongst Stentor members. In this respect, Bell Canada's practice is to procure the best products available from suppliers around the world, particularly new software-based management and value-added products.

During the course of the Committee's work, Bell Canada made known two initiatives which should help markedly in the development of a richer group of Ontario-based suppliers. The first initiative is the Supplier Certification Programme under which selected suppliers will be encouraged to meet the quality performance requirements of Bell — and hence of the international community — and in turn enjoy preferred status as a supplier to Bell Canada. The second initiative, taken during the course of our work, was to assign to Bell's Purchasing Department the mandate to work with interested suppliers and with government agencies to enhance Bell's supplier base. A manager was appointed to implement that mandate. We look forward to seeing concrete results due to the implementation of these initiatives.

A readily accessible domestic market is important to all telecommunications equipment suppliers. There is much innovative talent in Ontario with respect to the design, production and marketing of new telecommunications equipment. For those companies it is cheaper and easier to make their first installations in Canada, then enter the export field with a verified product. A closed market would deny them the right of demonstration of use.

The telecommunications equipment manufacturing sector is unlike traditional manufacturing. It consists largely of adding value to imported components through assembly, product configurations and testing. Much of the value-added is in the form of research and development, software and production management, functions which have traditionally been considered as "overhead". Direct manufacturing labour is now in the range of 5% of total product cost. Thus, the jobs created by the telecommunications supply industry are quality jobs demanding high skill levels. Very few of the jobs are of the traditional "assembly line" variety.

In spite of the difficult challenges, the manufacturing employees, managers and executives are convinced they can, and will, succeed in Ontario. They noted that, while the world demand for telecommunications equipment is growing at a compound annual rate of 10%, over the past two years, shipments from Ontario have declined 5.4% from $3,700 million to $3,500 million. As a first priority, they aim to stabilize the industry over the next two years and then push towards a full share in the global growth of the sector.

A Growing Value-Added Services Industry

This is one area in which the convergence of computing and more traditional telecommunications technologies, and the marriage of these with content (information, entertainment, culture), will have the most dramatic impact on how we communicate at home, at work and on the road.

The industry is not yet well defined, although it is recognized as the major growth area for the future. The industry includes:

Network developers and resellers. This is the traditional value-added service industry. It includes the cable television industry; EDI networks; providers of such advanced services as enhanced Centrex, voice and electronic mail, fax services and point-of-sale networks; and telecommunications resellers. The resale sector alone achieved 1991 sales of approximately $200 million.

Software designers and producers. Of the 150,000 people now employed in Canada in the development and implementation of software, 50% are in Ontario. The sector includes developers of software to be embedded in such products as telecommunications switches and private branch exchanges; and those who provide software services. Of the 150,000 people employed in software, 100,000 are employed developing in-house software for government and industry, including telecommunications.

Information providers. This is a very broad segment including educational institutions; database suppliers; entertainment services suppliers and ultimately the entire broadcasting industry and its content suppliers. There is presently little information about the "software" content of this industry. What is certain is that there will be dramatic new opportunities as computers, telecommunications, consumer electronics and media and publishing technologies converge over the next decade.

In all of these industry sectors, change is rampant — and in periods of change there are opportunities for growth. Already information flows freely around the world via telecommunications. Already enterprises are migrating from the use of information technology as cost containment, to its use as a creator of effective business processes.

Already the first generation of subscriber-controlled entertainment television has appeared. And already the constraints imposed by narrowband telecommunication channels are disappearing. Ontario's value-added industry is at the forefront of these changes. The industry is determined to lead the transition to an information economy and to be full participants in the global marketplace.

Internationally Competitive Carriers

While in some respects fully open telecommunications competition has been slow to come to Canada, in others it is not new. We live adjacent to the largest competitive market in global telecommunications. There, competition has spurred the introduction of new services, and large Canadian users are well aware of offerings and prices. Particularly through the use of private networks, corporations have taken advantage of the U.S. situation to bypass Canadian domestic and overseas facilities for lower priced U.S. facilities. Thus, in a very real sense competition is already here and for the carriers "internationally competitive" really means competitive with U.S.-based carriers. In addition, it also means being competitive with international carriers such as British Telecom, that are taking on the provision of services to North American customers.

Representatives of the carriers are determined to ensure that they match, or even surpass, the service availability and price structure of the U.S. carriers. They have a vision of success — one in which U.S. traffic is routed over Canadian facilities to Canadian gateways for onward transmission via Canadian international facilities.

Strengthening of Research and Development and Innovative Applications

Because of rapid technological change, growing competition in products and services, and the increasing globalization of economic activity, research and development has become a critical part of the competitiveness of the industry. Canada is a strong performer in telecommunications research and development. In a recent listing of Canada's top-100 Industrial Spenders, 34 were in the broadly-defined telecommunications industry, 24 of these were Ontario based. The total research and development commitments of those 34 companies in 1991 was $1,963 million. In addition, Ontario has an active information-based research community in its universities and Centres of Excellence. However, in certain aspects of this broadly-defined industry we are weak. We have no merchant microprocessor manufacturers, no indigenous computer manufacturers and few software product success stories.

We do, however, have our telecommunications research and development base to build upon. The proposed direction is for Canada (led by Ontario) to be, within five years, a world leader in the application of telecommunications research and development for commercial and social development. During this period the emphasis should be on applications, not on basic research. That is very deliberate, for it is in these five years that we must establish our leadership in the area of convergence between computing and telecommunications, and between these technologies and the information, culture and entertainment areas.

A key issue in the realization of this vision will be the supply of highly-trained people with the necessary skill sets. There is great concern that we are not attracting enough of our young people to careers in advanced technologies, and that we are not devoting sufficient resources to ensuring that our technical leaders have the necessary opportunities to remain

at the forefront of their technology throughout a long and fruitful career. Education and re-education are the fuel of successful research and development. Another critical issue for the industry is to create the synergies amongst participants that will enable the industry to sustain growth and competitiveness.

One particular approach discussed by the Advisory Committee is to encourage the growth of critical-mass geographical clusters of companies, supported by a "smart" infrastructure, in selected areas of the province. The cluster built around the strengths of Ottawa and surrounding municipalities in telecommunications and around the Waterloo and York regions represent an example of what can be achieved. Even here, however, further efforts are needed to sustain international competitiveness.

Another approach is to use the power of the telecommunications infrastructure itself to sustain a level of collaboration and interaction that will foster growth. This latter approach would be particularly useful for the pre-competitive and partnering activities that participants engage in. The Advisory Committee discussed the possibility of enhancing the ONet research and education network to assist the industry in this respect. The issue for the industry and for government will be to identify and focus on those elements of the support infrastructure which will quickly attain the synergies needed for growth.

Goal 3. An Enhanced Quality of Life

Goal: To ensure that telecommunications contributes to an enhanced quality of life for all Ontarians.

The benefits that telecommunications can produce extend beyond the realm of economic development. One of the cornerstones of the proposed strategy is recognition of the importance of telecommunications in enhancing the quality of life for all Ontarians.

Telecommunications has the potential to allow everyone in Ontario to have access to a wealth of services, including emergency services and health care, education and training resources, government information, library resources, a world of information and databases, cultural resources and programs, and a range of newly developing services provided both publicly and privately. Furthermore, telecommunications can and is changing the nature and patterns of work. Telework may, for example, become a way of life for many workers in the future.

A key point of discussion for the Advisory Committee was how to promote the social and cultural benefits of telecommunications while pursuing business and economic objectives for Ontario industry. There is a very strong connection between wealth creation and quality of life. In this respect, the Advisory Committee subscribes to the concepts of wealth put forward by the Banff Centre for Management in its draft Report on the First Roundtable on the Future of the Alberta Economy:

> Wealth is "a measure of how we meet human needs." Wealth is "well being — social, cultural, and physical. As a society, we are wealthy when we collectively feel good about our quality of life. Wealth *creation*, then, is the process of "taking our assets and delivering a standard of living with which we feel comfortable" — not just delivering, but also "sustaining and enhancing that standard of living."

Telecommunications, as an integral part of the new economy, can deliver an enhanced quality of life. However, there are issues to be addressed such as equity of access, privacy, and worker adjustment. How, for example, does Ontario ensure that all its citizens have equitable access to the expanding range of information and telecommunications services? Should a new definition of basic services be developed? If so, should these services be universally available at affordable rates? Do users pay for these services, or will some form of cross-subsidy be required? Should industry generally and the telecommunications industry specifically bear some degree of responsibility for these issues?

These and other issues related to enhancing the quality of life through telecommunications were discussed by the Advisory Committee under the following policy directions:

1. Equity and access;
2. Coping with a transformational technology; and
3. Creative applications of technology and services.

Equity and Access

Equity and access constitute perhaps the single most important policy issue in this area. Application of the equity principle means, among other things, the promotion of equitable regional development and the provision of high quality services to all residents of Ontario. The access principle means that all Ontarians should enjoy access to basic telecommunications services at affordable rates. The Advisory Committee also feels that in a knowledge-based economy the equity principle extends to access to information. Consequently, related to the equity and access principles, the Advisory Committee considered the following quality of life objectives that a telecommunications strategy should encompass:

- equitable access over time to a redefined set of basic telecommunications services at affordable rates, including digital service to the home, single party telephone service, access to a basic package of public information and services, and "911" emergency service;
- uniform telecommunications rates across the province; and
- accessible networks which connect individuals and communities across Ontario and Canada.

It is clear from the discussion in Chapter 1 that telecommunications can contribute to regional economic development. As we have indicated, the innovative applications of technology can be used to create new employment possibilities and improve productivity regardless of location and distance. The issue arises as to whether and how government and industry would undertake to accelerate the development of Ontario's telecommunications infrastructure and services.

In order to ensure equitable access to telecommunications services and access to equivalent levels of service everywhere in Ontario, as the above objectives imply, joint government-industry cooperation is needed. It is recognized, however, that the Ontario population is very dispersed. There are 31 local service providers in addition to Bell Canada, and technologies may vary given the nature of local conditions. As Canada has already

demonstrated, the implementation of innovative technology solutions (for example, the provision of satellite-based services to remote and rural areas) may respond to some local conditions. Such solutions may also lead to export possibilities.

In general, the objective of universal access gives rise to the question of who pays. The Advisory Committee recognizes that the costs of establishing and providing service vary significantly in different parts of the province.

Three options were debated: the individuals who benefit pay (a user-pay approach); subscribers as a whole pay (the method currently employed); or, government assists through a subsidy arrangement. It was noted that the move towards a market-driven approach to the provision of telecommunications services lessens the ability of the carriers to cross-subsidize non-compensatory areas. This issue must be given ongoing consideration in the implementation of a telecommunications strategy. The Advisory Committee examined the promotion of social equity and accessibility through affordability and endorsed the principle of equivalent prices for equivalent service regardless of location.

Preserving and enhancing access to telecommunications services while at the same time promoting reductions in long-distance rates and other services that improve Canada's international competitiveness poses difficult policy and regulatory problems that will necessarily involve the whole spectrum of residential and business users, government and carriers alike.

The provision of equivalent levels of public information is, however, an area under the direct control of government. In this respect, the Advisory Committee is of the opinion that the long range goal of government should be the development of a comprehensive interconnected electronic public information network. The aim would be to include government ministries, public and university libraries, public archives, community information centres and other such bodies so as to provide a wide range of information and government services to the public.

Coping with a Transformational Technology

The public is only now beginning to understand how far-reaching the impact of information technology will be. Consumers and businesses generally now use computers and communications devices that only a few years ago were the preserve of large corporations, institutions and governments, if at all available. These include powerful computers, answering machines, smart telephones, facsimile machines, video entertainment and communications devices, and an expanding range of multi-media terminals. A wide range of sophisticated telecommunications and information services are available or will soon be.

The impacts of such rapid technological change can be significant. On one hand, it can provide new means to enrich and enliven the daily lives of people in Ontario; on the other it can have serious detrimental effects. It can provide new means of personal interactions; provide increased access to information and services; and stimulate innovative ways of doing business, to name a few.

Issues of access to information and privacy arise in this context. The potential for inequities are increased in an information society between those who have access to information and those who don't. Government, in our opinion, should spearhead the

development of an information policy which permits all Ontarians to participate fully in the benefits of the transformation to an information society.

Public support for the development and introduction of new technologies and services will depend on perceptions that personal privacy and the quality of life are not compromised. The public will expect government, carriers and business users to act effectively to ensure that reasonable expectations about the security of personal information and privacy are protected. This will be facilitated by broad public consultation and cooperation among government, users, suppliers and business users to regulate effectively in this area.

The development of sophisticated database, software and telecommunications technologies enables the tracking, combining and analyzing of vast quantities of information from very many different sources. These technologies open up many value-added service and business possibilities. At the same time, they may permit access to private information or enable correlation of elements of information that may offend personal sensitivities. A central issue is defining the appropriate balance between public and individual rights within the reality of an information society. In addition, some of the new technologies have the capability to intrude on personal privacy in the way that "junk" faxes, telephone autodialers or caller identification devices are considered by some to do.

Some of the negative concerns in this area can be alleviated by greater user awareness. In the first instance, promoting an understanding of the technology and the availability and use of information resources would complement the development of an information policy. In addition, suppliers and manufacturers could facilitate the transformation to an information society by the development of user friendly systems and services.

Creative Applications of Technology and Services

There is considerable potential presented by telecommunications to increase the access and participation of all citizens in a wide range of social goods and services. A number considered by the Advisory Committee include the development of radically new ways of delivering educational and training services, particularly to isolated communities, both urban and rural; the use of telecommunications to improve health care delivery; the creation of employment opportunities, particularly in rural and remote areas; and even to stem the tide of environmental degradation.

Effective application of telecommunications technologies and services to the delivery of public services such as education and health care can reduce administration costs and improve quality and cost-effectiveness. It can also provide new ways of conducting activities outside traditional institutional structures. As noted earlier, it can also improve equity and access to public services in remote areas of the province. To this end, a telecommunications strategy for the province should coordinate all government ministries in the development of an action plan to use telecommunications to its fullest advantage, both internal and external to government. In particular, the strategy should encourage the Ministry of Health to use telecommunications for diagnostics, administration, education, and value-added services, and to promote equitable health care throughout the province. Furthermore, the strategy should address the development of a provincial educational network and encourage all ministries to develop educational materials.

Another important application is telework which permits people to work away from the traditional office or plant. Telework can have positive impacts in terms of permitting greater flexibility in the workplace, improving family life and lessening the environmental impacts of current work patterns. It can also have positive impacts by creating new employment opportunities, especially for the physically disabled. Telework can also have negative impacts which should be recognized. These include isolation of people in their homes, fewer opportunities for such workers to organize and the potential for lower wages. In addition, the home may not be as safe a place to work as the office. The positive and negative aspects of telework must be considered in developing a strategy. The Government should study this area and, in conjunction with organized labour and other interests, should participate in a project concerning telework to review the implications and propose guidelines that would address a number of the concerns.

Goal 4. Strategic Application by the Ontario Government

Goal: To ensure the strategic application of telecommunications by the Ontario Government.

This goal is aimed at a realization of the leadership role that the Ontario Government must play in the province as a major user of telecommunications products and services. It is directed at ensuring that the Government in its provision and use of telecommunications supports the strategy and uses telecommunications to its fullest advantage for the internal administration of government and for the delivery of efficient and effective government programs and services to the public.

In the achievement of this goal there is an opportunity to link improved customer service and changes to the way in which government provides service. However, government must decide what business it wants to be in, and must be capable of measuring results.

The Advisory Committee proposed the following policy directions:

1. Support for the provincial strategy vision;
2. Access to government services; and
3. Efficient government operations.

Support of the Provincial Strategy Vision

The Advisory Committee examined this particular policy direction from the point of view of the Government supporting the telecommunications strategy and coordinating the wide range of activities that might be appropriate for the purpose at hand. In short, the key objective is to coordinate the Government's own internal telecommunications strategies in support of the three previous goals that we have outlined.

We have indicated earlier in this report that Ontario is at the beginning of the transformation to an information society. Part of this transformation is the evolution to a knowledge-based economy — a national as well as global phenomenon and a major source of Ontario's economic renewal and job creation. As we have stated, we must "informationalize" our existing industries and create new ones. Within this context, the most important support for the telecommunications strategy that government can provide is to promote an understanding of this transformation and its implications.

Telecommunications, as an integral component of information technology, is a key enabler of change. However, the success of the strategy will very much depend on the extent to which its underlying premises are understood and adopted by government and the public at large. The success of Singapore, which has fully embraced the information revolution in its National Information Technology Plan, attests to the benefits that can be achieved.

We realize that what we are suggesting is a fundamental restructuring of Ontario's economy. We have outlined here some of the elements of this restructuring and the role that telecommunications can play. The development of a more complete understanding, its dissemination throughout government and to the public, and the adoption of strategies and actions which facilitate change will be instrumental in achieving the vision and goals of the telecommunications strategy.

The second level of support for the telecommunications strategy can be achieved by government using telecommunications to deliver information and other public services and directing its purchase of telecommunications services and overall procurement power in a manner that stimulates the growth of the domestic information technology industry. Government use of its purchasing power is a key lever to create a dynamic and growing sector. A good example of this approach is provided by the Government of Quebec which has adopted a strategy of outsourcing not just its telecommunications and information technology requirements but other functions as well with the specific goal of sector development.

In respect of supporting the telecommunications sector, the Advisory Committee recommends against a "Buy Ontario" policy. Instead, the Government should buy from Canadian firms where standards of excellence and price permit. It helps Ontario when Canadian companies succeed: by developing offices in Ontario, contributing to the Canadian economy and establishing partnerships.

Access to Government Services

This direction relates to how government can deliver services better to the public using modern telecommunications, and how the public can access government services better. Areas reviewed by the Advisory Committee included health care, education, and access to government information.

Education is key to success of the strategy and one of the most important areas of government involvement. Five major areas were identified:

Science Education. There is a need to bolster science education in the grade and high schools to ensure that there are more students receiving education in basic mathematics and science necessary for further education, and who see telecommunications as a possible career goal.

Training and Retraining of the Telecommunications Worker. Government can assist by increasing the supply of trained workers (related to the above point) and by the continuous upgrading and retraining of existing workers. Private sector efforts in this latter area would be enhanced by government involvement.

Increasing the Knowledge and Training of the Executive and Telecommunications Manager. The private sector should play a more active role in informing and

training telecommunications managers and business and government executives as purchasers and users of telecommunications technologies and services.

Educating the Public. There should be a public education program to sensitize the public to telecommunications and its applications, and how it can be useful in their lives.

Distance Education. The utilization of telecommunications technologies and services in providing educational opportunities to people who would not normally have access to these opportunities should be fostered and developed.

The Advisory Committee notes that the report of the Customer Service Task Force entitled "Best Value for Tax Dollars: Improving Service Quality in the Ontario Government" emphasizes that government's vision must be to commit to high quality service delivery which achieves the best value for tax dollars anywhere. The report indicates that Ontario ministries and central agencies must work together to set priorities, remove barriers and undertake bold strategies to meet the service expectations of government's customers.

The Advisory Committee subscribes to these views of service delivery to the public. Telecommunications, as we have indicated in other parts of this report, can substantially improve the quality of service delivery and reduce costs. In the implementation of customer initiatives to deliver service, the Government should adopt a principle of one-stop-access to these services. These services should be interactive. In addition, government should explore opportunities to provide telecommunications customer service applications in partnership with universities and the private sector. In part, this latter initiative would support development of the telecommunications sector as discussed in the previous policy direction.

Efficient Government Operations

This direction would see government using telecommunications to its fullest advantage for internal administration, through modern, cost effective services. Administrative coordination and policies depend on effective internal networks within and among ministries.

Although there have been a number of commendable initiatives within government that address this policy direction, much remains to be accomplished. The Government of Ontario, like many other governments, is today locked into the technologies of the past. For example, there are isolated computer systems throughout government which are expensive to purchase, costly to maintain and limited in their functionality.

In fact, from an information technology point of view, government ministries and agencies can be thought of as composing "islands of technology." For example, there is no access to corporate information for decision making, no government-wide electronic mail capability and no ability to deliver cross-ministry programs.

The Advisory Committee concludes that what is required in this area is a comprehensive information technology infrastructure for the Ontario Government. The Committee notes that an internal group called the Government Telecommunications Strategy Advisory Committee is developing the telecommunications backbone of such an architecture. A similar initiative is required which would create:

- an information technology mission statement;
- a business model of the Government of Ontario; and
- generic models of applications, information technology and work organization.

An information technology mission statement and the information technology infrastructure that would flow from it should include means for implementing this policy direction and goal. The information technology infrastructure, inclusive of telecommunications, must be independent of specific application requirements and must be capable of implementing unforeseen requirements. In this respect, implementation of specific services should be based on open system standards for both telecommunications and computer systems. The information technology infrastructure must also adopt a disciplined organizational approach to deliver a business vision. Finally, it must be consistent with the direction of other governments.

The Advisory Committee considered a number of procurement issues which relate to the establishment of an information technology infrastructure and the implementation of the telecommunications strategy. For the telecommunications strategy to be effective, the Government should strive to be the model user of telecommunications in addressing its priorities. Within this context, procurement can help the telecommunications sector to develop a strong domestic base for competing internationally. Specifically, the Government's procurement policies should recognize the following:

- Small suppliers need support in being able to tender for government contracts. This requires information and education on government procedures and processes;
- In order to develop a sustaining base of companies, government should share with suppliers in the telecommunications sector its long term objectives and strategies;
- For telecommunications and information technology, the Government should adopt partnership arrangements with the private sector; and
- While government does not purchase as one unit, it should set internationally accepted standards that would govern telecommunications and information technology purchasing. This is linked to the adoption of open systems standards as discussed above.

Such policies need to take into account the impact on the Government's labour force.

The Advisory Committee became aware of the fact that telecommunications and information technology purchases are not capitalized by government. This means that government purchases in this area are not amortized over a period of time, therefore limiting the capability of ministries to purchase equipment out of current budget accounts rather than capital accounts. The private sector capitalizes such purchases. The Advisory Committee is of the opinion that the Government should consider capitalizing such purchases so as to move more rapidly to implement the strategy.

Historically, information technology and telecommunications for government have been viewed as an internal matter. This should change as technology enables new trading relationships (e.g. with the banks and the public). This focus will shift from "internal systems" to inter-organizational systems as government goes online, extending its reach to suppliers, consumers and affinity groups.

Achieving the Goals: Vision Targets

Imagine, if you will, that Ontario has adopted the directions and dealt with the issues outlined above, has taken the steps to implement the vision and the strategic goals. What might our province be like at the start of the twenty-first century? We describe below a telecommunications scenario which we firmly believe can be achieved around the turn of the century.

This scenario supports the vision that through the enabling effects of telecommunications, Ontario, and in turn Canada, is the best place in the world to live, work, learn and do business. Furthermore, Ontario has made the successful transformation to a globally-competitive, knowledge-based economy.

By the year 2002, the goal of a telecommunications infrastructure that enables economic growth will be achieved such that:

- All stakeholders are actively pursuing a provincial strategy that helps Ontario maintain world leadership in information industries and telecommunications infrastructure. The strategy is, in fact, understood and promoted by citizens at large, representing a major commitment to its implementation.
- A ubiquitous, transparently mobile, digital, high capacity network infrastructure provides integrated voice, data, image and video services to meet the diverse requirements of businesses, government, institutions and consumers alike.
- Ontario businesses have available affordable, innovative telecommunications services equal to anywhere in the world which support their competitiveness and enable ongoing productivity gains.
- Advanced telecommunications services are available in all areas of the province, including rural and remote areas.
- A wide variety of telecommunications education programs are available, providing both technical and management training, for entry-level training as well as ongoing professional development.
- Ontario is a regional "world network hub" for telecommunications traffic — a hub through which substantial amounts of business and personal communications to and from North America and around the world pass and are directed by Ontario's advanced, high capacity network infrastructure. Attracted by its network infrastructure and knowledge-based economy, numerous information-oriented, knowledge-based global businesses have been developed in or attracted to the province.
- Ontario's network infrastructure contributes to a dynamic, knowledge-based society, sophisticated telecommunications users and a well-educated skilled workforce and provides access to an ever-growing number of Canadian information, entertainment and other services. In fact, Ontario's enterprises and consumers are demanding, leading-edge users that are aware of technology directions, who insist on the latest products and services and, in turn, stimulate the development of world-class suppliers to meet their needs.

By the year 2002, a dynamic, growing telecommunications sector will be achieved with the following characteristics:

- Based on a growing, open, competitive Canadian domestic information technology marketplace, free of interprovincial trade barriers, Ontario is world-renowned for high quality telecommunications products and services.
- An environment for appropriate and effective financing of the sector and the growth of entreprenurial has been established.
- A large pool of highly skilled labour, developed through life-long learning and by a strong educational and training sector, serves a growing industry sector.
- A rich assortment of telecommunications-based service companies are flourishing by selling value-added services in Ontario and throughout the world.
- There are a number of critical-mass, geographical clusters of telecommunications hardware and software firms in different areas of the province, with hundreds of other dispersed firms associated with them. Annual production of telecommunications equipment and software has grown from around $6 billion in 1992 to over $20 billion. Exports have increased five fold over the period. Much of this has been achieved by the smaller companies and start-ups who succeeded in part through their respective business clusters.
- Ontario's telecommunications carriers are considered the most successful in the world.
- Ontario telecommunications expertise is sought after around the world.
- Telecommunications research and development expenditures have increased from the 1992 level of approximately $1 billion to $5 billion annually. Telecommunications research and development, specifically, and research and development generally are supported by a very high-speed network which links researchers in Ontario to others in Canada and around the world.
- Ontario's mid-sized telecommunications firms have a significant global presence.

By the year 2002, telecommunications will have substantially enhanced the quality of life goal such that the following will apply:

- Information technology and telecommunications have now virtually merged, and a ubiquitous but invisible broadband, digital network infrastructure reaches into homes throughout the province, enabling the provision of a wide range of voice, data, image and video communications services.
- Ontarians who wish to do so have access to a wide variety of information and communications services in their homes that enhance the quality of life.
- Equivalent rates for equivalent services have been implemented across the province.
- A range of telework alternatives have been developed by labour and management and have been implemented, and telework is commonplace for those who wish to work outside a central office or plant.

- Privacy principles balanced against the right of access are followed in the development of new products and services.
- Telecommunications networks are used extensively to achieve wellness and health care and for life-long learning.
- Remote areas participate fully in the Ontario economy and society through telecommunications.
- Ontario-developed applications and services are selling well internationally and benefit others around the world.

The strategic application of telecommunications by the Ontario Government and the stimulative effects of government as a model user will lead to striking changes. By the year 2002, the following will be achieved:

- As a model user of new and emerging telecommunications technologies and services conforming to open system standards, the Ontario Government plays an important role in the cooperative development with industry of new services and applications.
- Using information technology and telecommunications, government has restructured its service delivery to improve public accessibility and to deliver a vast array of interactive services to the public.
- The Government helps the ongoing transformation of Ontario's economy and continues to stimulate the growth of a dynamic sector.
- Ontario citizens are becoming the most information and technology literate in the world.
- The province is contributing to the development of the most sophisticated public information infrastructure and telecommunications networks and services in the world.

Barriers to Achieving the Goals

Substantial barriers exist to achieving the goals and implementing the scenario outlined for the turn of the century. Perhaps the most significant barrier is a lack of understanding of the evolving knowledge-based economy. For many Ontario enterprises, telecommunications remains a cost item rather than the means to gain strategic advantage. As a consequence, Ontario enterprises are, for the most part, not the demanding, leading-edge users that will drive achievement of the scenario outlined above.

Suppliers are also insufficiently aware of the real needs of business and the applications that can be strategic for business success. There is a substantial gap between suppliers and purchasers, both from an understanding of the capabilities of telecommunications technologies and services to solve business problems and a knowledge of application requirements. This situation is exacerbated by uncertainty over technology directions and a relatively long period between the development and implementation of new services, particularly in the domestic market.

At a policy level, there is a lack of consensus on the trade-offs between the goal of universal access to affordable basic telecommunications services and the introduction of

competitively-priced and innovative services. From an economic performance point of view, this situation is highlighted by pricing comparisons with the United States. With long distance telecommunications services provided at prices above those in the United States, both economic activity and telecommunications traffic are attracted to that country. The result is an environment in which established suppliers seek to consolidate their domestic positions in the face of global competition, but where there is little stimulus, capability or encouragement, particularly for small and medium-sized companies, to experiment with, develop and market the innovative applications which will accelerate Ontario's transformation to a knowledge-based economy.

Achieving the goal of a dynamic and growing telecommunications sector is closely linked to the infrastructure goal. The sector tends to be technology and supply driven rather than customer or demand driven. Thus, as the enablers of a knowledge-based economy, it is not clear that Ontario's telecommunications firms understand the critical role they must play and the transformation the sector itself must undergo.

On a global basis, the telecommunications industry is becoming intensely competitive, particularly for the equipment sector, and increasingly so for the service sector. Consequently, Ontario suppliers will face substantial competitive threats, even in the domestic market, from foreign competitors that are significantly larger, have greater financial resources, have wider access to world markets and are better supported by their governments. With such formidable obstacles, the cost of entering the foreign market is high, particularly for small firms. The problem is compounded for the small and medium-sized equipment firms in that the domestic market is largely closed and they are consequently forced into the foreign market at the outset.

Ontario has a strong base on which to build its telecommunications equipment industry. It is, however, dominated by one large company, Northern Telecom. At the present time, the future of the sector is tied very closely to the future of Northern Telecom. Such a dependency raises the level of risk, and places the burden of global competitiveness on the shoulders of one company.

There are in addition, a number of factors, largely external to the sector, which will slow achievement of the sector goal:

> There is insufficient investment capital available to the industry to fuel the development of new products and services. In general, investment capital is perceived to be too expensive or investors lack knowledge about this field and are reluctant to take the risks associated with investing;
>
> The sector suffers from a shortage of the skilled people necessary to enable the sector to support a knowledge-based economy and to grow as a sector itself. This is particularly true for the marketing, managerial and engineering staff required to develop and market the products and services described earlier;
>
> Whereas Canadians excel in telecommunications research and development, and the Ontario Government has a number of pre-competitive research activities which it supports, not enough research moves from the laboratory to the marketplace. Canadian inventions are often developed elsewhere or not at all because of a lack in Canada of willing capital, insufficient marketing and management expertise and

few potential partners who are willing to work with the entrepreneurs and/or small to medium-sized companies who often generate new ideas; and

In many areas Ontario and Canadian users and suppliers have been slow to embrace industry standards. For example, it was not until this year that the Ontario Government adopted open systems standards for telecommunications, and it has yet to embrace open systems for computer procurement. This is in sharp contrast to most other leading governments in the Western World. Without standards-based procurement, Canadian suppliers lack the motivator of government purchasing power to get in line with the direction of the global marketplace.

As we have noted in the previous section, equity and access are perhaps the single most important policy issues in achieving the quality of life goal. This is expressed in the scenario in terms of universality of access to a wide range of information and communications services and equivalent rates for equivalent services. Achieving these aspects of the scenario will, however, be difficult. For example, the costs will be high to provide broadband services to the many dispersed residences across Ontario.

Many of Ontario's consumers lack sophistication in their use of telecommunications services, generally purchasing only the basic services. The situation is perpetuated by the benefits of using advanced telecommunications products and services not being measured or communicated, for example, by suppliers. With such a lack of understanding, the demand for advanced information and telecommunications services is likely to remain low.

The situation is exacerbated by the technology. The networks and terminals that should transparently provide the wide range of integrated services to the public that we propose suffer from a lack of consistent standards and interoperability problems.

The Ontario Government could assist in removing these barriers by taking advantage of the opportunities to use telecommunications to provide its services to the public. The demonstration effect could be substantial. However, there is strong evidence that the Government is considerably behind other jurisdictions in this respect.

There is a growing awareness in the Ontario Government of the benefits and potential of information technology and telecommunications. However, there is no coordinated plan, either for service delivery or internal use. Inconsistent standards, the lack of an overall information architecture and divergent, uncoordinated initiatives within government act as barriers to achieving the scenario we propose.

Generally, the problem arises at the management level. For the most part, the senior management of government, not just in Ontario but elsewhere in Canada, is not aware of the potential of telecommunications, its uses and applications. Discussions of information technology are often perceived as having little relevance to the burning issues of the day. In addition, there is the perception that the upfront costs of developing and implementing this type of service delivery could be prohibitive, and that ongoing telecommunications costs will skyrocket. The offsetting benefits to government from more effective and efficient service delivery and operations have not been convincingly presented.

Chapter 3

INITIATING ACTION

Without question, Ontario is today one of the best places in the world to live. However, as outlined in the previous chapters, the continuation of this enviable position is not assured. We are persuaded, however, that telecommunications can play a vital role in ensuring that Ontario will meet the challenges brought about by the information age and global competition and will be the best place in the world to live, work, learn and do business.

To secure a leadership position, the Advisory Committee believes that the province must adopt a strategic approach to telecommunications.

The Committee commends the Ontario Government for its initiative in establishing this process. The Committee feels that a broad strategy, following from the four goals — a telecommunications infrastructure which enables economic growth; a dynamic, growing telecommunications sector; an enhanced quality of life through telecommunications; and the strategic application of telecommunications by the Ontario Government — is both appropriate and essential to achieve the overall provincial vision.

Figure 3-1 presents, in summary, the Advisory Committee's recommended telecommunications strategy for Ontario. The vision, goals, directions and vision targets were discussed in Chapter 2. This chapter focuses on an action plan to achieve the vision, namely:

1. The need for codetermination and cooperative action to implement the strategy;
2. Six "strategic thrusts" which together constitute the launching of a public "Campaign for an Ontario Information Infrastructure" which cuts across all four goal areas; and
3. An ongoing plan to ensure implementation of the strategy.

Codetermination and Cooperative Action

Central to the realization of our vision is a process of codetermination and cooperative action amongst all stakeholders. Encouraged by the example of the Advisory Committee itself, and its sub-committees, we believe strongly that a strategy can be successful only by including those players — business, labour, institutions, communities, government — directly involved in bringing about Ontario's telecommunications future.

Achieving the strategy goals also requires changing the way we think about our work, our business and our institutions. There is a need, and a significant opportunity, for each

participant to look to a bigger picture, recognizing that it is in our own interest, and in the interests of Ontario and Canada. Only by working together in defining a desirable future, and by acting cooperatively in bringing this future about, can the vision be achieved.

The magnitude of the changes needed to our organizations and institutions and traditional relationships to meet the challenges we face is enormous. What is needed at the level of the firm (management and labour); sector (large and small providers); industry cluster (telecommunications enabled manufacturing); and across institutions (between supplier and user; government and industry) is a recognition that new ways of thinking and new ways of acting are required to ensure Ontario's success in the future information society. While recognizing an appropriate role for competition, there is also a role for cooperation. Traditional adversarial approaches will not work, nor will the sum of independent actions necessarily bring about our desired vision. Change at all levels, a transformation of all our institutions, is required for Ontario's success in the new economy.

The vast scope of this telecommunications strategy — covering telecommunications as a sector and an enabling infrastructure — necessitates the involvement of many participants to ensure Ontario's future success. Regulators, carriers, manufacturers, policy-makers, residential, business and institutional users, workers, researchers, governments at all levels, and many others play an important role. Establishing a common vision and shared strategy, will provide a framework for both independent and cooperative actions to help bring about this vision.

Therefore, the Advisory Committee recommends as a guiding principle for an Ontario Telecommunications Strategy, a wide ranging and continuous process involving stakeholders codetermining future possibilities, learning together, and acting cooperatively — in their own interests — to ensure a jointly-held future vision for Ontario. We can assure the future only through an ongoing process of stakeholder partnering, change, tracking and renewal.

The Campaign for an Ontario Information Infrastructure

The Advisory Committee recommends a broadly-based provincial campaign for an Ontario Information Infrastructure as the central focus of the telecommunications strategy. A provincial infrastructure of information, services, and facilities, including networks, is essential to ensure that all Ontario businesses and residents have access to, and are full participants in, the emerging information society. Such an infrastructure is necessary to achieve our vision and can be brought about by a market driven approach, balanced with supply-oriented initiatives, amongst many partners.

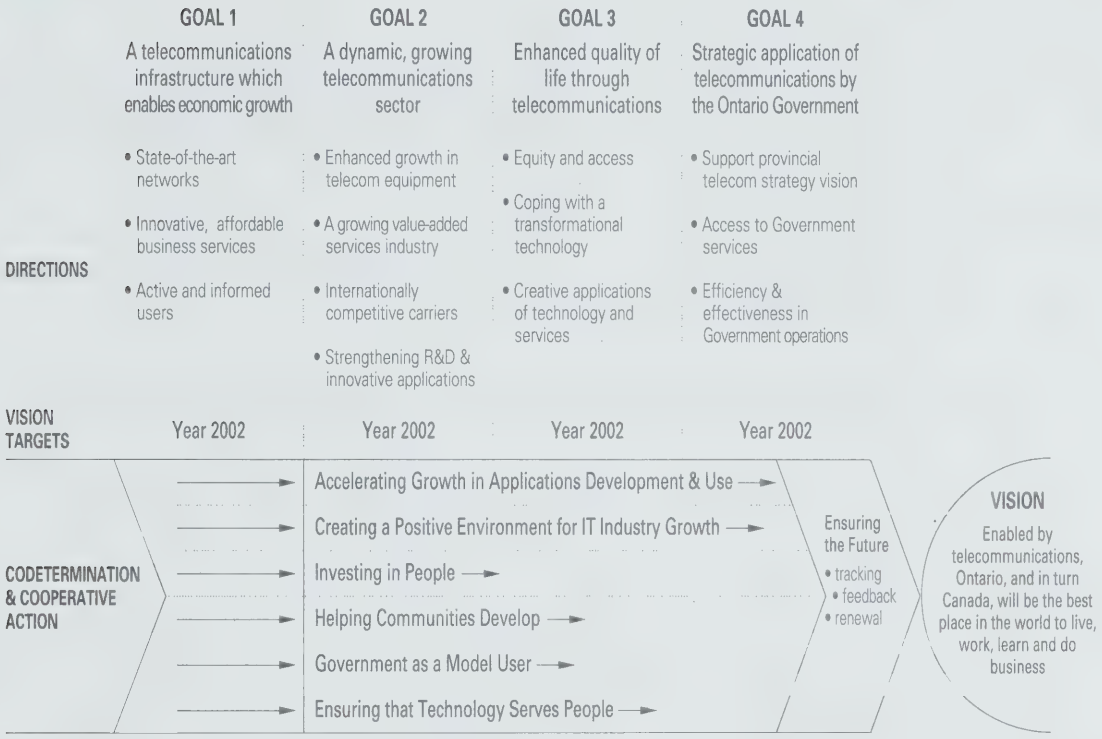
The provincial government should take leadership in the establishment of this campaign through the adoption of a policy which states clearly that Ontario will advocate and encourage access by all Ontario residents and businesses to an ever-expanding range of voice, data, image and video services to meet their needs. Ontario should be a strong advocate for, and participate in the development of, the necessary policies, processes and initiatives which will bring about this information infrastructure.

The Advisory Committee has set a ten-year horizon for the achievement of this information infrastructure in order to maintain Ontario's leadership position in the

Figure 3-1

A Telecommunications Strategy for Ontario

Campaign for an Ontario Information Infrastructure: Strategic Thrusts



information society of the future. This is a major undertaking designed to provide Ontario users of telecommunications services with a range of innovative and competitively-priced products and services better than or comparable to anywhere in the world. This strategy, based on real needs, will also support a strong and growing sector. However, there is no single policy or initiative, no matter how large, which can create this infrastructure. Instead, the Advisory Committee has developed and recommends six strategic thrusts as mutually reinforcing steps towards the achievement of the information infrastructure and the overall provincial vision. The six thrusts are:

- Accelerating Growth in Applications Development and Use
- Creating a Positive Environment for Information Technology Industry Growth
- Investing in People
- Helping Communities Develop
- The Ontario Government as a Model User
- Ensuring that Technology Serves People

Together these thrusts, which are based on the analysis presented in the previous chapter, address the four goal areas, and the needs of the sector, the economy, individuals and their communities, and the Government itself as a major user of telecommunications.

In selecting specific initiatives, the Advisory Committee considered a number of criteria. The Committee examined the achievement of the goals and policy directions, through initiatives which have measurable results and which maximize benefit to cost ratios. We also focused on initiatives which are capable of being implemented, which promote partnerships and cooperation, and which will lever spin-off and other benefits through partnerships or subsequent initiatives.

There is a mixture of short-term, quick action, initiatives, and longer-term strategies. Many of the recommended initiatives will have an impact beyond telecommunications and have broadly-based public economic and social benefits. Details of the six thrusts are presented below.

The Advisory Committee received a number of specific proposals that were very helpful in developing the six thrusts. The details of some of these are presented in the Appendix as noted throughout the recommendations.

Thrust 1. Accelerating Growth in Applications Development and Use

The Committee proposes a set of integrated initiatives designed to secure a place for Ontario as a world leader in the development of information technology and telecommunications applications and to ensure that their full benefit is experienced first in Ontario. These include activities intended to stimulate the growth of networks which provide access to a broad range of voice, data, image and video services, to foster the development of a diversity of new applications, to acquaint people with the benefits of new technologies and applications for their particular use, and to facilitate the reshaping of institutions and work through information technology.

The creation, distribution, analysis and use of information is the life-blood of an information society. A broad range of information networks based on communities of interest is rapidly emerging in Ontario. These networks will serve a vitally important role in a dynamic Ontario information infrastructure. In some senses, they are major applications of telecommunications themselves. Such networks are crucial vehicles for empowering individuals and communities and for bringing about a society of the "information rich." They can allow researchers to talk to one another; teachers to share information and ideas; students to talk to teachers; librarians to communicate; local communities to share information; and, environmental activists to explore issues. They are the information pathways for the information age.

These networks also serve as an invaluable source of new applications development and as a rich environment for acquainting large numbers of people with information technology. The Ontario Government must take leadership in promoting the growth of these pathways and in coordinating and assisting the development of these rapidly emerging specialized information networks into a "network of networks." This will facilitate access to and the exchange of information which is the currency of an information society.

The Committee has a number of recommendations which support the development of information networks. Some of these are directly related to other strategic thrusts, but they are mutually reinforcing. The Committee recommends:

1. The Ontario Government lead in coordinating and assisting in the development of the rapidly emerging specialized "public networks" into a "network of networks" which would promote interoperability and common standards, potentially making Ontario into a centre for network management study and expertise. To this end, the Government should strike a partnership with existing and planned network groups, the telecommunications carriers, including cable, and other directly involved interests to develop an effective development plan by mid-1993. Networks should include: a research and education network; libraries networks; environmental networks; community information networks; and others. (The Appendix provides further details on the Network of Networks proposal.)

2. The Ontario Government be a leader in providing one-window access to information and services in a convenient manner through telecommunications. Other jurisdictions are experimenting with various approaches and several projects are underway within several ministries of the Ontario Government. Without slowing the pace of the implementation of planned projects by various ministries, the Ontario Government should develop a plan to implement an "Ontario Online" service within two years. This service should be designed to complement and support existing services such as that provided by Community Information Centres. (The Appendix provides a brief outline of the Ontario Online proposal.)

A vital component of the information infrastructure is the ability of physical networks as well as the community of interest networks to allow for the seamless exchange of information. To this end, the Committee recommends:

3. The industry, users and the Government should be strong advocates of interoperable networks and open access, and play a leadership role in the area of standards development and adoption. This could be accomplished by increasing the resources devoted to participating in standards bodies and championing Ontario as a world centre of standards activity.

4. The telecommunications carriers, both wire and wireless, and cable television companies work together to support the development of an interoperable environment and interworking applications.

5. The telephone and cable television industries work together to promote extension of service to unserved and underserved areas.

To support and encourage the development and use of new applications and the widespread use of these to experience the fuLll enabling benefits of information technology and telecommunications the Committee recommends:

6. Establishment of a Centre for the Reengineering of Work Through Information Technology supported by a partnership among telecommunications carriers, users, government and suppliers. This institution would be modelled on the existing provincial Centres of Excellence and be a centre for the development of applications, expertise and software for the information technology enabled reengineering of work. Working with both the public and private sectors, and at the level of the individual process, work group, or firm, the Centre would study and develop information technology and telecommunications applications to increase competitiveness, efficiency, and/or effectiveness. In addition, at the inter-

enterprise and sector level, the Centre would examine business processes and applications, including examining barriers to the widespread adoption of EDI. (See the Appendix for additional details on a Centre for the Reengineering of Work through Information Technology).

7. Establishment of a telecommunications demonstration centre which would be a combined resource, training and promotion facility where the latest applications and technologies could be demonstrated to potential investors and customers. This centre could be based on existing facilities, such as the icomm Centre, the Centres of Excellence or other facilities. As one of its first and ongoing activities, this centre should undertake an awareness campaign targeted at small and medium-sized businesses to encourage the use of telecommunications to increase productivity and to improve competitiveness.

Just as the application of information technology presents a major opportunity for doing things differently, so it offers a major opportunity to reconsider where our work is located. In particular, information technology and telecommunications allow for off-site work. Working at home or in a different location than a centrally-located office could become a matter of choice for many employees. There are numerous potential benefits for the self-employed, employees and employers in off-site work, as well as potential environmental and other benefits to society overall. There are also areas of possible concern, ranging from the importance to workers of the social dimensions of work, to the rights and responsibilities of employees and employers. These need to be evaluated and a set of guidelines established that respect the rights of the individual. The Committee recommends:

8. Labour, in partnership with government, "telework" organizations and interests, and businesses involved in off-site work, initiate an omnibus research project concerning off-site work to evaluate and determine the benefits of and concerns related to off-site work. This project would focus on diverse projects underway or in the planning stages in the private and public sectors, including the Ontario Government. Products should include preparation of a guide for off-site work initiatives and recommendations for new projects, including those involving the partners to the project as a demonstration of commitment and leadership. (See the Appendix on a Telework Project for Ontario.)

To support the overall campaign for an information infrastructure, the Advisory Committee recommends:

9. The Government, in partnership with telecommunications service providers, including cable television and mobile service providers, labour and user organizations should launch a public awareness and education initiative to develop a broad-based knowledge of technologies which people will be using to access information and services as part of an information society. Many of the recommendations which follow support this initiative based on the approach of learning by doing.

Thrust 2. Creating A Positive Environment for Information Technology Industry Growth

Ontario must be successful in the high-growth industries of the future if it is to secure a prosperous future and ensure a rich social and cultural life. The telecommunications and

other information technology industries are among the most dynamic of the high-growth sectors, and ones in which Ontario is already a strong world player.

But Ontario cannot stand still. Governments in North America, Europe and Asia-Pacific have also identified this sector as the economic building block of their futures. They have already instituted strategies to position their domestic industries as world leaders.

As a result, both the need and the opportunity exist for Ontario's telecommunications industry to be a significant creator of new wealth and employment in the province. Several of Ontario's current telecommunications equipment and service providers are already successful global players. On the strength of their hard-earned reputations for quality and their skill at penetrating new markets, they have the potential to grow even larger. Their prosperity will encourage new and smaller firms to innovate in their own quests to develop other new products and applications.

If the Ontario telecommunications sector is to remain at the forefront of developing, applying and marketing advanced technologies, an environment that encourages the creation and expansion of leading edge companies will be required.

A strategic thrust aimed at creating a positive environment for the success of our telecommunications and information technology firms addresses directly the goal of a dynamic, growing sector. Specifically, it aims to promote the growth of equipment manufacturing and software providers, to encourage the development of innovative, value-added services, and to create a climate where telecommunications research and development can thrive.

The Committee proposes a series of initiatives that encourage the continued development of a telecommunications sector which creates new wealth and employment in the province. These include policies and programs to both stimulate demand and encourage supply.

Growing the Market

In order for firms in the information technology industries to flourish, they must have access to large and growing markets. The Canadian domestic market is too small to generate the production economies necessary for global competitiveness. The consequence is that Canadian suppliers can prosper only if they compete internationally. However, it is very difficult to enter export markets without a verified product in use with a major client.

The Province of Ontario is one of the largest purchasers of goods and services in the country. As an intelligent first user and the most demanding customer of Canadian telecommunications suppliers, the provincial government and its agencies could have a significant influence on the development of new products and services in the domestic market and the growth of companies providing them. Generally, this influence has not been exercised with a view to stimulating the growth of our telecommunications, software and information industry.

While not suggesting that outside purchasing is appropriate in every case, a major opportunity exists for the Ontario Government to work with our large and small suppliers to develop the equipment, services, software and information products necessary to serve the Government's vast needs and help position Canadian firms to meet market requirements

elsewhere — in Canada and around the world. A government contract, for example, can help lessen the research and development investment risk for small firms — by providing them with a partner in the marketplace — and allow them to demonstrate an effective installation with a large and knowledgeable user. Our small and medium sized companies in particular are poised to contribute to job growth and wealth creation for Ontario.

The Committee therefore recommends:

1. The Ontario Government adopt a policy which recognizes the significant contribution of purchasing services, software and information products, and expertise from the private sector as a means of developing the sector.

2. Within the context of competitive processes to ensure excellence in quality and comparability in price with currently available products and services, the Ontario Government adopt a procurement policy for information technology, including telecommunications, that recognizes:

   - the importance of supplier development as a tool for industry growth;
   - the important role of partnership arrangements between government and the private sector, including those fostering relationships between large suppliers and small suppliers, as a support to industry growth;
   - international standards to support supplier viability in export markets;
   - the crucial nature of interoperability and open systems;
   - information and education on government processes and procedures should be made available to all suppliers, especially small suppliers, to ensure they are knowledgeable and informed on government procurement and funding practices; and
   - the benefit of sharing with suppliers the Government's long-term objectives and strategies in information technologies and telecommunications.

As noted, competition today is global and the Canadian market is small in world terms. To restrict or fragment the market artificially is to limit growth opportunities for domestic suppliers. An open, competitive domestic information technology market provides more choice for end-users and allows domestic product and service providers to hone their skills.

To respond to the needs of users and to foster improved access to the Canadian marketplace for Canadian telecommunications equipment, software and services firms, the Committee recommends:

3. The Ontario Government support a growing, open, competitive domestic information technology marketplace in Canada, free of interprovincial trade barriers, unless there is a compelling public interest to the contrary.

4. The Ontario Government advocate federal regulation of major telecommunications carriers so as to promote a coherent, dynamic national market which encourages innovation and responsiveness. The Government should be an active intervenor in federal policy and regulatory processes in the provincial interest. Ontario should

champion the removal of regulatory roadblocks that stifle innovation and the introduction of new services.

Canadians are good at telecommunications. But our success in telecommunications is largely unknown overseas. As a result, companies seeking to locate in North America do not make Canada their first choice and lucrative telecommunications contracts often go to non-Canadian firms.

Substantial growth in telecommunications will only come from the successful penetration of offshore markets. In order to increase exports and to attract investment, there is a need to develop broader foreign awareness of Canadian telecommunications product and service capabilities. To that end, the Committee recommends:

5. Government, industry and user organizations jointly establish a program by January 1993 to educate federal and provincial trade officials on the domestic telecommunications industry and its capabilities.

Encouraging Supply

Manufacturing is important to the economy of Ontario, and trade is important to manufacturing. Dependence on trade is particularly critical for telecommunications equipment suppliers because of the limited size of the Canadian domestic market.

But relative to some other North American jurisdictions, Ontario is a high-cost production area. As a result, Ontario equipment manufacturers, especially in a free trade environment, cannot compete solely on price, they must compete on product differentiation, quality, service, reliability, and high value-added, and they have been very successful in the past. Despite this, the dollar value of telecommunications equipment shipments from Ontario has declined 5.4% over the past two years while world demand has grown at a compound annual rate of 10%. To ensure that Ontario remains an attractive place in which to manufacture and perform research and development, the Committee recommends:

6. The Ontario Government establish a program, by November 1992, to effectively and continuously monitor the overall conditions for manufacturing in the province to ensure that overall operating conditions are competitive with other jurisdictions.

7. The Ontario Government, as an ongoing challenge, ensure that the environment for research and development is at least as good as in the areas with which we compete. Although Ontario is one of the most attractive jurisdictions in the world to perform research and development, the province must closely monitor and quickly react to external initiatives which may prejudice Ontario's competitiveness in this regard.

One of the necessary conditions for the success of a vibrant industrial sector is the existence of an underlying support system — an infrastructure. The telecommunications sector is no different. It too requires specialized "infrastructure" initiatives.

Canada is a small but active player in the global business of telecommunications. We can perform internally only a small percentage of the relevant basic and applied research in telecommunications and related fields. At the same time, we cannot afford to be ignorant of the vast amount of research performed elsewhere.

Canada must therefore become an outstanding trader and exploiter of the world's intelligence. This function can best be enhanced by a concerted, organized effort to gather, sort, and disseminate original knowledge in telecommunications. To this end, the Committee recommends:

8. The Government of Ontario evaluate the feasibility of building a repository of world knowledge in telecommunications research and development, including an international centre for telecommunications software. It should also function as a telecommunications standards clearing house and share current information with Ontario companies, their suppliers, and their customers. (See the Appendix for further details of the International Software Repository.)

9. The Government of Ontario support establishment of an Ontario high-speed network for research, development and education. As noted in the previous section on applications, the benefits of such a network would go far beyond the sector, to support research, development and education in all fields. The network should link government, academic, and corporate researchers in all fields and serve as a test-bed for the development of leading-edge information technology products and services. (A specific proposal is presented in the Appendix under the Network of Networks heading.) In order to ensure maximum benefits to Ontario, this proposal should be adopted and funded by October 1992.

Such infrastructural initiatives will benefit all companies in the sector, regardless of size or location.

There is a need to encourage entrepreneurial new firms, particularly in the area of software development. One of the most serious issues for innovative, small and medium-sized firms is access to financing. Most critical is the shortage of venture capital and of investors knowledgeable in the management of high technology ventures. The Committee therefore recommends:

10. As a matter of urgency, the Government of Ontario determine what is needed to encourage the growth of high technology venture capital funds and implement the necessary changes. The proposed Ontario Investment Fund should be included as part of this evaluation.

In order to foster the development of critical-mass clusters of telecommunications hardware, software and associated firms in the province, we must increase the number of companies engaged in the performance and commercialization of research and development. This effort can be accelerated by a sharing of knowledge and expertise among all companies in the sector. To this end, the Committee recommends:

11. The Government of Ontario work with the large suppliers and research and development performers, including universities and the Centres of Excellence, to develop mechanisms to transfer technology to smaller companies and to build the capacity and interest of these firms to receive technology.

12. The province should continue to support the Centres of Excellence in the telecommunications and information technology fields, but encourage them to develop a greater bias towards applications and the transfer of technology to smaller companies.

The sharing of knowledge and information should not be limited to research and development performers. There is a clear need to develop vested relationships among research and development performers, producers, and end-users to ensure a market focus for research and development work. The Committee recommends that:

13. The Government of Ontario establish a program to encourage producers and end-users to collaborate in developing new applications.

Thrust 3. Investing in People

The title of this section borrows its name from a March 1992 report by the Information Technology Association of Canada entitled "Investing in People: The Key to Canada's Prosperity and Growth." Throughout the Advisory Committee's deliberations the involvement of people and their knowledge of the new economy and the information society were considered to be critical. Each of the sub-committees, despite their very different subject areas, quickly pointed to people and knowledge as major factors in realizing the Telecommunications Strategy goals. As a result, recommendations regarding training and education are to be found within several of the six strategic thrusts.

As noted above, the sub-committees and the Advisory Committee expressed concern about the educational and training requirements of people in order to utilize and take full advantage of existing telecommunications technologies and services to support the existing economy. They were very concerned that as we make the transition to knowledge-based economy, the chronic and acute crisis in education and training must be addressed.

Specifically, concern was expressed about the need to train and retrain workers in the industry so that they can keep abreast of rapidly changing technologies and work processes; about the need for greater numbers of skilled managers and marketing staff in the sector; about the looming shortage of professional staff able to contribute to research and development activities; about the importance of telecommunications user organizations having available staff who are knowledgeable about information technology and services and can advise their organizations on how to improve the competitiveness or increase the efficiency of their business through telecommunications; about the need for managers and executives in companies and in government to realize the full potential of the convergence of computers and telecommunications to change the way they conduct and define their activities and gain strategic advantage.

Telecommunications also provides significant opportunities to teach, train and inform people at home, at work, and at play. It extends our reach and potential as a learning society. It challenges us to think of new ways of encouraging learning outside traditional institutions. It allows people in remote areas to gain access to knowledge and training not available otherwise in their communities. Telecommunications can allow us to build people networks where individuals can learn and share information and ideas with others, quickly and easily. Educational and training organizations, and industry, labour, and all levels of government, should increase their use of telecommunications as a means of delivering education and training. Video instruction could be delivered over one-way noninteractive circuits or over two-way interactive circuits. In addition, computer based

training and development could be developed via telecommunications. The software development for such applications should encourage growth of a dynamic industry in the province. To take advantage of the tremendous social and economic investment in existing colleges and universities as well as telecommunications organizations and institutions, all stakeholders must look to build on the existing roles of these institutions. In this regard, the icomm Centre in Brantford, and its proposed telecommunications institute, present an opportunity to develop linkages to other activities and to build on the identified icomm roles to further telecommunications in Ontario. Examples of a few recent initiatives were noted earlier in this report.

Clearly, a significant cluster of actions related to educating people is needed to support and advance all four goal areas. The Advisory Committee therefore recommends:

1. To address the information and knowledge needs of the new economy, a partnership process involving industry, labour, all levels of government, and other stakeholders should develop an education and training strategy to address short and long-term requirements. A consultative process which extends beyond the responsibilities of any one ministry, and which recognizes and builds upon the driving force of the information technology itself, should be established as a matter of urgency involving schools, colleges, universities, libraries, user associations, other institutions, labour, business, industry, government as well as other stakeholders. The Advisory Committee is aware that there have been a number of studies and there are a number of initiatives underway relevant to this recommendation. These studies and initiatives should not be duplicated, but should form a starting point for this initiative. One such initiative is the Premier's Task Force on Life Long Learning. The recommended consultative process should address:

   A. Training and retraining requirements for skilled and professional staff;

   B. The declining pool of science, technical and engineering graduates available to the information technology and telecommunications industries; and

   C. The management and marketing training requirements of staff employed in these industries, particularly those in small to medium-sized firms.

2. To address the organizations which use educational and training needs of telecommunications, user associations should take the lead in organizing a process to evaluate the effectiveness of current approaches to informing and training telecommunications managers and senior executives. This process should involve representatives of educational and training institutions, user organizations, associations, governments, and others. The process would develop and implement measures to improve training and access to training. This will address the needs of telecommunications users and help these organizations capture the full benefits of information technology.

3. To address both of the above noted needs, the provincial government should:

   A. Create a "Telecommunications Institute" to provide one-window access to diverse telecommunications educational and training programs offered in

Ontario educational institutions. Such an institute could identify program needs and gaps, encourage new programs, develop educational standards, review and recommend curricula, recommend and review research, and carry out other appropriate educational functions.

B. By December 1992, launch an investigation into the feasibility of establishing a "virtual university" to provide specialized training and degree programs in the workplace, or at other locations. This would be a telecommunications-linked "university without walls" where students are taught by an instructor via two-way interactive telecommunications channels.

Thrust 4. Helping Communities Develop

Telecommunications can help communities of interest and geographically isolated or remote towns and villages to take full advantage of economic, cultural and social life in Ontario. It is a tool for empowering communities and individuals, and providing access to information and knowledge. It can support and strengthen community life, putting people in touch with one another. In addition, it can help address regional disparities, increasing the potential for businesses to be established in towns, villages and cities throughout the province.

The flourishing world of specialized and special interest networks was addressed earlier as a vital resource for applications development and as a key part of a provincial information infrastructure. The focus of this section is on networks as a tool for social, cultural and economic development in communities of all sizes and locations, including communities within larger metropolitan areas. There is also a focus on the potentially significant role of telecommunications as a means of enhancing the economic development and stability of smaller municipalities throughout the province, especially Northern Ontario. A strategic thrust aimed at helping communities develop responds directly to our goal that telecommunications enhance the quality of life.

The Committee, therefore, recommends:

1. That community networks be encouraged and supported. These networks should serve both as a platform for information and as an interactive communications vehicle. Means of encouraging growth can include providing incentive funding to municipalities or organizations prepared to establish community-based telecommunications networks to meet municipal or community needs. Such networks should be built on existing community networks if possible. Development of such a program, including criteria for funding should commence immediately, with funding to commence in 1993. (See the Appendix Network of Networks proposal.)

2. The establishment and support of a municipal/regional pilot project to demonstrate the potential of telecommunications to support economic development and strengthen community infrastructure as a basis for economic stability, espcially in Northern Ontario. (A proposal for such a demonstration project is contained in the Appendix under the heading Community Economic Development and Support.)

Thrust 5. Government as a Model User

The application of telecommunications presents a major opportunity for the Government of Ontario to address both its own internal priorities and to support an overall provincial telecommunications strategy. The important role of government both as an example to others in its use of information technology and telecommunications, and through this use the creation of demand for the private sector, was raised by virtually every sub-committee and is recommended as a major strategic thrust by the Advisory Committee.

There is an historic opportunity for the Ontario Government to be a model user of technology in carrying out its business and to reshape the Government: to improve the efficiency and effectiveness of the Government's internal operations; to improve program delivery and customer service, including the encouragement of synergies across ministries in service delivery; to allow for a more open government through two-way public access; and to reduce government expenditures, and the deficit. In short, technology could result in an "electronic government," with increased openness, improved customer service, and more efficient and effective program delivery. As a model user, the Government would also set an example to others in the use of technology.

In addressing its own business priorities, the Government can also create demand for the private sector through the development of new applications, and as a demanding user of telecommunications products and services. In this way the Government will stimulate infrastructure as well as sector development in the province. In fact, given the geographically dispersed nature of government operations, and their huge size and scope, it is hard to imagine an organization whose use of telecommunications would have a larger and a more pervasive influence. Development of technology-based applications, combined with the Government demanding excellence in its purchase of telecommunications products and services, will encourage the development of a growing and globally-competitive sector in Ontario. It will also support, not through subsidy, but through the responsiveness of suppliers, the further development of a modern infrastructure throughout the province.

The Advisory Committee recommends a three-pronged approach to this strategic thrust: the reshaping of the Ontario Government as a model user and a leader in the information society; the retooling of the technological platform within the Government; and the realignment of the organizational structures for information technology within the Ontario Government to provide a ministerial focus.

Reshaping

The opportunity presented by information technology and telecommunications goes far beyond the application of a particular set of technologies to the Government's business. Rather, the application of technology presents an opportunity to change the very way in which the Government's business is done to, as noted above, improve government service and provide for a more open government. This might be termed the "reinvention" of government for the information society.

There are two historical views regarding the role of technology in organizational change. These views are either: it is first necessary to understand and respond to procedural and human implications of a technology prior to implementation; or, conversely, it is first

necessary to reshape a manual system prior to implementation of a new technology. Neither view is appropriate. Given the enabling effect of the new technologies, there is an opportunity to jointly change and optimize the social and technological components of the work system at every level: work team; business process; ministry; government; and with agency and private sector partners.

The Advisory Committee recommends the following initiatives:

1. The Government of Ontario should immediately establish a cross-ministry forum to review current initiatives underway within the Government, and the lessons of other organizations and jurisdictions, with a view to providing leadership and momentum for change in the shaping of the Ontario Government as a model user. Although the Advisory Committee has not had the time to develop the details of such a forum, it might be considered a Council of Administrative Renewal.

2. Among the priorities of the Council would be the development of an awareness campaign for senior staff, and an education and training program for managers and staff at all levels, on the significant opportunities presented and changes required through the application of information technology to the Government's operations and services.

3. The Council would also develop and champion initiatives and applications, especially government-wide initiatives, which lead in the provision of government information and services through telecommunications. Such initiatives could include the further development and expansion of the information network Ontario Online to increase public access to government information and services, (as outlined previously and in the Appendix), and the identification of new business opportunities for the Government in partnership with the private sector.

Retooling

The Government has recently taken an excellent first step in the establishment of a new technology platform within the Government through the extensive work of an inter-ministerial committee on telecommunications. The Advisory Committee was given a presentation on this internal telecommunications strategy and the proposed GO-Net and commends the work of the Government in taking this first step towards the establishment of a standards-based technology platform for the use of all ministries and Schedule I agencies of the Government. However, for the full realization of the benefits of information technology for improved services at reduced costs, this effort should now be extended beyond telecommunications to develop an overall information policy and information technology architecture for the Government.

The Advisory Committee recommends that:

4. Building on the success of the Government Telecommunications Strategy Advisory Committee, a similar, collaborative inter-ministerial initiative be established to develop an Information Policy and a comprehensive information technology architecture for the Ontario Government. (A proposal for An Information Technology Architecture for the Ontario Government is presented in the Appendix.)

5. The Government should endorse electronic data interchange (EDI) and adopt a goal, and supporting policies, to ensure that all structured transactions within the

Government, and with the Government's external partners and clients, be electronic by the year 2002.

6. The Government should encourage telecommunications-based applications development by:

   A. supporting the existing initiatives of the Ministries of Consumer and Commercial Relations, Transportation, the Attorney General, Health, Treasury and Economics, Education, and Tourism and Recreation, amongst others. The Advisory Committee recommends a health care initiative for priority attention (see the Appendix for a Health Care Network project description);

   B. establishing an incentive funding program that encourages innovation and collaboration amongst various government ministries; and

   C. establishing a Premier's Awards program that gives a high profile to ministries and their private sector partners which have developed new telecommunications-based applications by the Government to address any of the following priorities: improved efficiency or effectiveness of government operations; improved customer service; potential for long-term cost reductions to government or revenue generation potential; new or improved two-way public access (i.e. interactive services); or involving two or more ministries.

7. In recognition of telecommunications and other technologies as essential modern infrastructure, the Government should consider capitalizing, rather than the current approach of expensing, the financing of telecommunications and other information technology investments in the Government.

Restructuring

The changing role of organizations, combined with the push of the new technologies, is causing governments to rethink how they are structured to provide leadership and management for information technology. While recognizing that there is no single correct organizational structure for one organization for all time, it is not apparent to the Advisory Committee that the current organization in the Ontario Government is optimal. There are many players with roles that are not fully clear, many organizations providing leadership in particular areas, including the Ministries of Culture and Communications; Industry, Trade and Technology; Management Board; Treasury and Economics; Government Services, the Premier's Council on Economic Renewal, and individual ministries. Given the opportunities presented above for the application of information technology and telecommunications by the Ontario Government for significant benefit both to the Government and to the province, now is an opportune time to stand back and reexamine the structure.

Within the context of this strategic thrust, it is the Advisory Committee's view that realignment or restructuring is required to provide leadership regarding the need for change within the Government, to provide a focal point for change, and to allow for the pooling of resources. Based on experiences of other governments, it does not necessarily make sense to centralize decision-making. In fact, those organizations that have the highest level of telecommunications contribution to their business, often tend to be those that have dispersed responsibility and empowered individuals, while protecting corporate

information and processes through policies and standards, i.e. there can be a new liberalizing effect through standards. It may also make sense to parcel out certain functions like delivery and operation of the network to a government agency, a crown corporation or even to the private sector. Governments elsewhere have adopted both approaches.

This issue has been examined by previous governments including previous recommendations to establish a new ministry with responsibility for communications and information technology. What is required is an examination of the issue, involving key stakeholders, carefully studying the lessons of other governments and even the private sector.

Thrust 6. Ensuring that Technology Serves People

Telecommunications has the potential to become a very powerful tool to enrich and enliven our daily lives. The shape life in Ontario will take in the coming decades is unknown. But it is clear that we are in the midst of a profound transition that will have an impact on every facet of modern life. This period of transition is an unstable time for Ontarians. It is a time when the terms "information overload", "invasion of privacy", and "global village" take on new meaning. Access to information is increasingly tied to personal and economic development. As the "information age" begins to take shape the importance of the gap between people who have access to information and those who do not is magnified. Strategic initiatives aimed at ensuring that telecommunications is used to its full potential by all members of society addresses the strategic goal of enhancing quality of life through telecommunications.

(1) The Ontario Government should lead in the development of an information policy that recognizes the social and economic value of information and establishes and enunciates broad principles. (A specific proposal, based upon the proposal of the Ontario Library Association Task Force on Information Policy, is included in the Appendix.)

The role of privacy in our society is complex. There can be no easy technocratic solution to the human need for a private life — especially when this need is perceived to be in jeopardy from a fast-moving new technology. Concern is heightened when data banks are linked through networks to other data banks.

In the transition to an information-oriented society, trade-offs must inevitably arise, and conventional notions of privacy will be affected. Unless there is widespread public understanding of both the benefits and the costs inherent in the transition, the result will be social disharmony — at best. The Federal Government has recognized this issue in its recent announcement of a consultation process to develop privacy principles. Ontario should participate in this process.

2. In consultation with others, the Government of Ontario should develop and advocate guidelines for the introduction of new telecommunications products and services that promote and balance access to information and the protection of personal privacy. (A proposed approach to this issue is presented in the Appendix under the heading Access to Information and Security of Privacy Guidelines.)

The Ontario Government for many years has adhered to the principle of universal access to basic telephone service at affordable rates. In fact, governments and regulators

throughout Canada have long pursued universal service as a major policy objective in the provision of telecommunications services. A key issue facing policy makers today is the need for redefinition of basic service. As more and more innovative services are made available through the infrastructure in terms of value-added or enhanced services, a change in the definition of basic service is required.

3. The Ontario Government should advocate a broadened definition of basic service to include, by 1999, a single party service, access to a basic package of public information services, digital service by choice, and 911 service across the province. (More detail on this recommendation is provided in the Appendix, Telecommunications Basic Service 1999.)

Ensuring the Future

Just as the development of this report on Ontario's telecommunications strategy has been a participatory process among a large number of partners who have a stake in the future of telecommunications in Ontario, so must there be ongoing leadership and a partnership approach to ensure the achievement of our vision for the Province through telecommunications. The Government of Ontario alone cannot ensure the province's success in the development of an information infrastructure in support of our vision. Nor can a single company, or even all the participants within the industrial sector. This report has repeatedly referenced, for example, the important role of users in leading the way, and the strong, and potentially synergistic linkages among researchers, manufacturers, carriers, other suppliers, labour and users, among others. The Government's role as a leader and catalyst for change, as a policy-maker and regulator, as a model user, and as a potential partner in numerous initiatives has also been identified throughout this framework for action, and the need for change in our institutions and decision-making processes.

The Advisory Committee commends the Ontario Government for its establishment of the process which has led to this report, and its support to the Committee in its work. The Committee is pleased with the results it has achieved in developing recommendations for a provincial telecommunications strategy and specific initiatives to ensure Ontario's future leadership in the information society. However, in the short space of time allowed for the Committee's work, it has not been possible to develop fully the necessary partnerships. We feel strongly that the momentum established by this process must be continued and that there needs to be an ongoing process of codetermination and cooperative action, supported by the Government, to ensure not only that work begins immediately on the implementation of positive actions for change, but to ensure that Ontario continues to take the leadership in a period of rapid change.

Numerous recommendations have been made for the Government's consideration, many of which have specified particular partners and/or time frames for their implementation. While not going so far as to suggest that the Government must accept each and every one of our recommendations for the vision to be achieved, we have presented a carefully planned and balanced strategy for an information infrastructure, to move Ontario forward aggressively by actions in many simultaneous strategic thrusts. We urge the Government and other partners to examine these recommendations carefully and take immediate steps to commence action.

Many stakeholders must participate in this strategy if our campaign is to be successful. But most importantly, a successful campaign requires strong leadership. The Ontario Government should provide that leadership to ensure the momentum and the vision. We urge the Government to establish the necessary vehicles, involving external partners, and providing the necessary internal coordination. This does not mean centralized decision-making with respect to all initiatives; it does mean leadership, communication, coordination and concerted action among many partners.

The Advisory Committee therefore recommends that, as a priority, the Government of Ontario establish a Council for an Ontario Information Infrastructure to act as an ongoing champion and campaign team for the provincial telecommunications strategy. This action-oriented Council, made up predominantly of members external to government, would provide leadership, bring partners together, monitor progress, and report back to the Government on progress with respect to the individual initiatives and the achievement of the overall vision. In order to ensure focus and coordination, the Council would be supported by the Ministry of Culture and Communications and would report on a regular basis to the Deputy Minister of Culture and Communications. As one of its first priorities, the Council would set priorities for action and establish the action teams. In the spirit of this report and initiative, the composition of this Council should be established by a process of codetermination.

Appendix:

FURTHER DETAILS ON PROPOSED INITIATIVES

Network of Networks

Ontario Online

Centre for the Reengineering of Work Through Information Technology

A Telework Project for Ontario

The Ontario International Software Repository

Community Economic Development and Support

An Information Technology Architecture for the Ontario Government

Health Care Network

Ontario Information Policy

Access to Information and Security of Privacy Guidelines

Telecommunications Basic Service: 1999

Network of Networks

In an information society the free flow of information and the ability to connect with information systems is critical. All true participants in an information society are at once producers, distributers and consumers of information.

To promote the creation and exchange of information, Ontario in partnership with the interested parties should support the development of an open system that would facilitate the interaction of existing and future networks. This "network of networks" would set and promote open standards and protocols to simplify interaction.

The "network of networks" would promote interaction among many different kinds of communities of interest and their networks, such as: libraries, education and research, Government, environmental groups and community networks.

Ontario Community Networks would serve as an easily accessible computer-based medium of information exchange and an electronic marketplace for the local economy in information and related services. Based on appropriate standards, locally-based networks would evolve so that each community can become an active part of a province-wide network. Access to each local network should be broadly based — through local libraries, shopping centres, municipal buildings, community information centres, women's and seniors' centres, other community organizations, plus, as much as possible, through people's homes. Input to the network would be equally broad, with information content developed by local people and institutions. Both the local community networks and the provincial network (of which each community network would be a part), should be open-ended to evolve over time into an ever-richer provincial resource, which can also serve as a public gateway to health-information reference services and other value-added information services. The network should also serve as an electronic marketing context to enhance commercial and non-commercial services offered in communities. The local networks and the provincial network need to be initiated and fostered with broad community support and commitment. Decentralized decision-making, with coordination at a province-wide level, is key.

One example of a community network are the "FreeNets" which are beginning to emerge in communities around the world. They are, essentially, an electronic bulletin board which promotes information exchanges using telecommunication networks. It is especially useful to individuals with restricted mobility. Individuals regardless of location can plug into the network to find like minded individuals to create and share information on topics of mutual interest.

Another example of a network that would form a crucial part of Ontario's "network of networks" would be an Ontario Research and Education Network (OREN), a partnership of research and education networks in the province.

OREN would promote the exchange of information and collaborative work within the educational and research and development communities. It could include, for example, a gigabit test-bed connecting Ottawa, Toronto and Waterloo to provide a platform for the development and testing of new telecommunications and information technology products and services. OREN would also form, for example, a partnership with the existing Ontario research and education network (ONet), which for the most part is university-based, and also complementary to similar proposed Federal Government initiatives.

OREN would serve many different functions. At its most sophisticated level, it would facilitate access by researchers in universities, Centres of Excellence and industry, to each other and to specialized facilities such as supercomputers, gigabit testbeds and other international networks and facilities. Such a service would increase the amount of advanced research and development undertaken generally, and specifically information and telecommunications research and development.

OREN would also promote the exchange of information and collaborative research by university students and professors on different campuses and in different cities. Students all across Ontario would have the opportunity to work with the most knowledgeable professors in Ontario and throughout the connected world in various fields. The network would facilitate like-minded individuals or communities of interests to electronically meet and exchange information.

The network could also permit students, across Ontario, from elementary through to post graduate fellows, to access teachers, professors, courses and library resources not available in their own community. Students in Ontario would have access to a broad selection of teachers, courses, up to date information and resources regardless of their location or time of year or day.

OREN could potentially also be available to the general public requiring skills upgrading to either improve their job or to find a new one. The service could be accessible through local schools, community colleges, work site training centres, libraries or community information centres.

OREN could be established as a cooperative of member networks and institutions. The physical network would be leased from major carriers. Some equipment would be required to connect the many different local networks. System support staff would also be required to manage the traffic, develop applications in cooperation with users and to plan the system's service growth.

Ontario Online*

The concept of Ontario Online is for the Government of Ontario to provide government information and services to the public in a convenient and simple manner through telecommunications.

Using familiar technology, similar to automated banking machines or video cassette dispensers, the Government would make its information and services available to the public in many more locations, throughout the province, 24 hours a day, 365 days a year.

Such a service system should provide better, more up to date information and services, at more convenient times and locations and in a less costly manner than present approaches allow.

Ontario Online could have three components: provision of information to the public; provision of services to the public, and business; and direct communication with government. Services could include:

- accessing information on government programs;

- payment of taxes and levies;
- accessing specific business information;
- receipt of subsidies and grants;
- accessing information on contracting and tendering;
- submitting tendering information;
- receiving public government reports; and
- purchasing government services and materials.

The system could be connected to the banking system so that payments can be made automatically. Information should be accessible by phone and computer terminals using existing technology. Public terminals could be in provincial, municipal and school buildings, libraries, community information centres and public malls.

The Ontario Online service will be developed in collaboration with Ontario-based companies. There will be an applications development component to the program, in that the service will continually be up graded to provide more and better services. The Government of Ontario will encourage Ontario-based companies to develop new software and technology to improve the service. There is also an opportunity to generate revenue and a return on the Government's investment through partnerships with the private sector and the sale of government information in some cases.

In order to promote universal access, regardless of location, or system sophistication, Ontario Online will be a non-proprietary telecommunications network. Anyone, with access to any network, would be able to access this service.

In conjunction with the proposal for the development of an Information Policy for the Ontario Government, policies and mechanisms will need to be developed with the respect to access, privacy, pricing, etc. and other issues. The various initiatives underway across the Ontario Government, for example the Ministry of Transportation's kiosk pilot project, will need to be integrated into this larger proposal, without delaying their development or implementation.

* Community Information Centres (CICs) operate a service called Online Ontario in a number of communities. The proposed new service would need to respect the valuable role these local bodies perform in providing information on a community basis.

Centre for the Reengineering of Work Through Information Technology

State-of-the-art telecommunications networks and services, in and of themselves, do not have much value. The innovative use of these networks, however, is critical to the competitiveness of a country's economy and therefore its wealth creation. As indicated throughout this report, information technology can facilitate major productivity gains in all industries throughout the economy. Benefits, however, go beyond just speeding up processes. Telecommunications can actually change the basic processes, or work itself. Francois Bar of the Berkeley Roundtable on the International Economy notes that:

> [telecommunications] offer[s] the possibility to imagine and implement new services, and to use these services to reorganize traditional activities in new ways and places. Information networking technologies make radical product and process innovations possible. (Francois Bar, "Configuring the Telecommunications Infrastructure for the Computer Age: The Economics of Network Control" Working Paper 43, 1990, p.1.)

In the present global economy it is essential that Ontario firms, both large and small, continuously take advantage of the potential of information technology, including telecommunications, to innovate and remain competitive. For example, in manufacturing, many factories are now directly linked to their markets in the outside world so that output and production mix can be adjusted instantaneously. Francois Bar notes the example of Benetton, the successful Italian clothing company, observing that: Benetton...was among the pioneers who ran direct lines between shop floor, warehouses, and retail stores cash registers.

The establishment of a Centre for the Reengineering of Work through Information Technology, modelled on the existing provincial Centres of Excellence, will allow Ontario to lead in the development of modern business enterprises based on the application of information technology and telecommunications.

The proposed Centre differs from the existing telecommunications and information technology Centres of Excellence in that it would examine and develop alternative business processes through the use of telecommunications technology. The Centre would bring together the resources of users, carriers, organized labour, suppliers, educational institutions, and government in focusing on innovative applications that would alter fundamental processes of businesses in our economy. The Centre would work with both public and private sectors, small and large firms. Various levels of work processes would be analyzed including individual, work groups, enterprise and inter-enterprise levels. The Advisory Committee believes that as a minimum the Government should fund a comprehensive feasibility study for this proposed new Centre of Excellence.

A Telework Project for Ontario

Telecommunications technology can facilitate greater flexibility in the actual location of work.

Telework can mean many different work arrangements, such as: working at home, full or part time; working at a satellite office, full or part time; working out of a vehicle, or bringing extra work home after hours.

Telework has been promoted as a means of improving the quality of life of workers and thereby increasing their enjoyment of work and productivity. It also may reduce overhead costs for employers thereby reducing their costs of production. Off-site work may also have other public benefits such as reduced traffic congestion, transportation emissions and road maintenance costs.

However, there are a number of labour management relations concerns; such as: impact on family life, ability to organize, mode of supervision and compensation schemes, which require further investigation.

As part of this initiative, labour, in partnership with government, business, and other interested parties, should establish a mechanism for the collection and dissemination of information on telework programs in industry and government and develop mutually satisfying approaches to off-site work initiatives. Preparation of a telework guide, acceptable to labour, business and government, would help facilitate the implementation of telework initiatives that would benefit workers, business and our environment. In addition, this project should stimulate new initiatives for telework including demonstration projects within the Ontario Government.

The Ontario International Software Repository

The Ontario-based International Software Repository would be a world centre — a library, clearing-house — of software components that would support applications development and the growth of the information technology/telecommunications sector in the province.

The Repository would help Ontario be a leader in the next technology wave in telecommunications and information technology which is based on the concepts of object-oriented software development and multi-media applications. Object-oriented system design is based on the idea of fitting together reusable software components (or "objects"). The availability of libraries of reusable "objects" will result in a "piece-part" assembly approach to the creation of usable software and could lead to higher productivity levels. This will change the nature of the production of software as well as the nature of the software itself. Developing such a repository in Ontario would ensure that the latest and best software "objects" in the world would be available to Ontario researchers and companies.

The International Software Repository following initial seed funding, would be funded and governed by users and suppliers of information technology, including telecommunications equipment and service providers. The Repository, for the most part, would operate on a fee basis.

The Repository could provide the following types of services:

- a distributed database (in-house and linked to supplier systems) of commercially available software objects. The database would include software objects produced by "user" organizations (traditional customers) in addition to components from traditional suppliers;
- an exchange to provide a worldwide electronic point of access between registered customers and suppliers of software components;
- standards compliance verification;
- reference publications;
- research market requirements and technology/standards development; and
- education and training.

Community Economic Development and Support

Telecommunications can be used to overcome many obstacles, including distance and economic and social isolation. The Ontario Government could support a limited number of municipal and/or regional groups in the preparation and implementation of local telecommunications action plans to improve the local economy and quality of life.

The development of local telecommunications action plans would be of particular interest to northern Ontario communities, with a declining natural resources base, looking to diversify their economy.

A number of communities have already expressed an interest in developing such plans in order to prepare their communities to participate in the global information economy.

Some of the aspects of such plans may include the following:

- upgrade the telecommunications links to the community to allow access to more sophisticated services;
- attracting information-based functions (credit card transaction processing, telemarketing) which are not location dependent;
- locally accessing educational (K-13) and retraining courses through telecommunication links with specialized service providers, such as universities and community colleges;
- establishing information-based services, such as an environmental centre in the community that can export their services (information);
- establishing a "real time, online" health diagnostic service to provide access to top quality services without the cost of patient transportation; and
- establish an "electronic incubator mall" to support the development of information-based industries and services.

In order for such a strategy to work, it would require the demonstrated support and participation of all the interested parties in the local community (business, labour, education, health sector and local government).

The Ontario Government could support the local commitment in terms of bringing together the diverse interests and finding the resources to assist with local initiatives. Federal Government participation in this collaborative effort would also be useful.

The Ontario Government should participate in a limited number of pilot projects to evaluate the costs and benefits of developing local municipal or regional telecommunications action plans.

An Information Technology Architecture for the Ontario Government

Government program operations and service delivery are increasingly dependent on information technology and telecommunications networks. To be efficient and effective, the architecture of the networks must be flexible, open, and based on a design requirement for shared government telecommunications, decentralization, and common systems. In addition to meeting current user needs, the architecture must contribute to a technology platform for migration to future services.

To develop an information architecture for the Ontario Government, a collaborative inter-ministerial committee should be established. The committee would first develop the design requirements for the architecture through a process of consultation with Government of Ontario information users, service users, information and service administrators, and an analysis of user and client needs. Once the design requirements have been specified, the committee could work with vendors in order to produce an actual design for the architecture.

It should be noted that the architecture:

- is independent of specific application requirements and capable of implementing unforseen requirements;
- has a disciplined organization of the information technology infrastructure to deliver the vision;
- includes standards beyond telecommunications, (e.g. standards for data and information, operating platforms, software development, user interfaces, etc.)
- requires implementation of specific services based upon industry (open systems) standards.

The private sector, and other government jurisdictions are developing information architectures and making strategic investment in technology to revolutionize services and administration. The Ontario Government, however, appears to be lagging behind. This lag represents a lost opportunity for Ontario to lead in this important application of telecommunications and information technology. The Government can however learn from the experiences of others, and move to a state-of-the-art architecture and thereby "leapfrog" to a position of leadership in the provision of government services and the management and provision of information.

Health Care Network

The Ontario Ministry of Health has developed a proposal to connect over 25,000 health practitioners in over 10,000 locations across the province.

The initial purpose of this service is to support the administrative or business aspect of health care, such as:

- Claims processing;
- Reconciliation advice, error notification;
- Roster updates, service authorization;
- Bulletins, fee schedules;
- Product price lists, health product procurement;
- Patient accounting, financial systems; and
- Materials management.

Once the administrative functions are operating successfully by providing more timely information, reducing errors and lowering administrative costs of the health care system; more sophisticated services can be offered that deal more directly with the provision of health care.

In the near term these value-added services could include some of the following:

- Drug interaction and utilization information, which would minimize drug interaction complications; and
- Access to diagnostic and treatment aids, such as: medical reference databases, medical smart systems, electronic conferences and meetings with distant specialists.

In the longer term, the following value-added services could be incorporated into an Ontario Health Care Network:

- Patient care management systems which provide more up-to-date and comprehensive information on patients and reduce the need to fill in patient history forms;
- Remote diagnosis and bedside terminals to provide more timely information without increasing staff;
- Medical record and image transfer to reduce loss and duplication; and
- E-mail for referrals and consultation.

The development of such a service should provide up-to-date and accurate medical and administrative information to health practitioners about their patients. Regardless of location, health practitioners would be able to access the best sources of information in order to most accurately diagnose their patients.

Ontario Information Policy

Ontario is part of a growing international information-based society. In order for all Ontarians to participate fully in economic, social and cultural life, there is need for equitable access to the most up-to-date information.

The Province of Ontario should develop, in partnership with key stakeholders and interests, a strategic information framework and action plan that will guide the very many future public and private sector decisions on information-related matters.

The report of the Ontario Library Association's (OLA) Task Force on Information Policy "A Proposal for an Information Policy for Ontario" outlined the need for such a policy framework; the interested parties that should be consulted during its development; and the possible contents of such a policy framework.

The OLA report suggests that a Provincial Information Policy should:

- recognize the social and economic value of information;
- recognize the right of Ontarians to equitable access to information;
- serve as a strategic framework for future policy development, legislative changes, the design of government programs, and the setting of guidelines for strategic alliances between government and the private sector;
- establish and enunciate broad information-related principles, including:
  - universality of access;
  - pluralism of expression;
  - intellectual freedom;
  - decentralization of control;
  - right of privacy.

- develop a set of goals and responsibilities; and
- recognize, in broad terms, the role of each key partner.

The OLA report further recommends a series of priority actions the Provincial Government should undertake to make such an information policy a reality.

Access to Information and Security of Privacy Guidelines

Ontario, in consultation with all interested parties, should establish a set of principles to guide the treatment of electronically stored and transmitted information. These guidelines should balance the rights of the creator, the right to access public information and the right to individual security and privacy within the context of modern information and telecommunications technologies.

The development of sophisticated information technology and software enables the tracking, combining and analyzing of vast quantities of information from very many different sources. These technologies open up many value-added service and business possibilities. At the same time, these technologies may permit access to information to which individuals may not want others to have access. The central issue is defining the appropriate balance between public and individual rights within the reality of an information based economy.

A number of agencies have begun to define such a set of guidelines. The following are example principles raised:

- privacy should be explicitly dealt with when considering the introduction of a new technology;
- no listening, viewing or recording without prior consent;
- fair warning before devices like speaker phones and caller identification are used;
- joint ownership of transactional data to insure joint agreement on any subsequent use of the data and any gains from its sale;
- those technologically altering privacy should bear the cost of restoring it;
- set a minimal threshold of privacy available to all;
- consistency of broad principles across all technologies, wired or wireless;
- mechanisms for discovering violations and receiving compensation are required,
- intellectual property rights and the rights of the creator must also be recognized and guarded.

The development of such guidelines requires a cooperative effort of many diverse interests, such as: creators - authors; producers - publishers; disseminators - distributers/networks, libraries; conservers - archives.

A set of access to information and security of privacy guidelines should be developed within the larger information policy framework discussed previously. The Federal Government has recently announced a consultation process to develop policy principles. Ontario needs to take an active role in this process.

Telecommunications Basic Service: 1999

Ontario should establish a modern definition of basic telecommunications services and commit to have those services available to all Ontarians, regardless of location, by 1999.

In the information age all aspects of life revolve around the creation and exchange of information. To insure equitable participation in this society, all Ontarians, regardless of location or socio-economic status, will require access to a broader set of basic telecommunications services.

The proposed definition of basic telecommunications services could include, subscriber choice of access to:

- digitized service;
- single party service;
- a basic package of public information and services;
- 911 emergency response service; and
- new telecommunications services, regardless of location, within seven years of commercial introduction anywhere else in the Province.

Providing such basic services within the target date, will require the cooperative efforts of not only the Government of Ontario, but also the telecommunications carriers, the regulators, the Federal Department of Communications and municipal governments.

The particular technology used to provide the equivalent services may vary due to local conditions. Wireless systems, such as satellite dishes, may be more cost effective than conventional systems in some more remote locations.